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REPORT ON FISHERY ACTIVITIES IN THE DEVELOPING COUNTRIES OF AFRICA, ASIA AND LATIN AMERICA AND THE CARIBBEAN*

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* The views expressed by the author in this paper do not necessarily reflect the views of the UNIDO Secretariat. This is a translation of a document which has not been formally edited.

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CONTENTS

Page

DETAILED DESCRIPTION ACCORDING TO REGIONS AND COUNTRIES

AFRICA 3

ASIA 26

LATIN AMERICA AND THE CARIBBEAN 64

AFRICA

Principal characteristics of fishery activities in the region

1. The supply of fish is of special importance in Africa. Particularly high levels of per capita consumption are recorded mainly in the central and eastern zones of the continent. While fish accounts for a larger share of the human diet in all the developing countries than in the developed nations, still there are important differences between the three regions considered in this analysis. In Africa, the per capita consumption does not reach the maximum values typical of South-East Asia, but greatly exceeds those of Latin America. Nevertheless, there are ten countries in the region where the annual per capita consumption is below four kilograms.

2. While "industrial-scale" fisheries do exist, they cannot properly be said to supply the local markets. On the contrary, consumption habits are centred on products associated with non-industrial-scale techniques, such as those used in small-scale fishing and handling and in the kind of processing that results in salted, dried and smoked products.

3. A characteristic of small-scale operations (or of subsistence or family operations) is the high-level of self-consumption. A very commonly observed pattern is that of men engaged in fishing and of women engaged in the preparation of the fish for sale or consumption, a production arrangement under which the economic circuit is very rapidly closed. It is also common to observe group work at the level of small communities or co-operatives with varying degrees of organization, which, despite the existence of a substantial element of self-consumption, succeed in producing raw material for the industry.

4. In the face of an unsatisfied demand for fish in many countries, a number of them, despite their financial difficulties and lack of monetary resources, import large quantities of fish from neighbouring countries and other zones. At the same time that the region imports products with limited value added, such as whole frozen fish, it exports major quantities of high-price products, especially to Europe, a fact that greatly improves the trade balances and produces sectoral surpluses in a number of the countries concerned. During the period 1980-1981, the countries of West Africa as a whole imported more than one million tons of frozen fish.

5. Deep-water fishing is normally based on agreements with third countries. Domestic industrial underdevelopment is coupled with an absence of middle- and higher-level technical personnel and skilled workers of the kind required for the application of intermediate technologies appropriate to local conditions.

6. In most of Africa, women can be observed performing a basic role in the traditional forms of work, since it is they who see to the preservation, processing, valorization, distribution and sale of fish and fishery products.

7. A characteristic of the region is the difficulty of transporting fishery products towards the interior, a fact that is reflected in a marked difference in diet between those populations located close to the production areas and others that, although not that far away, are not well supplied.

8. Considered as a whole, the continent exhibits a very irregular pattern of distribution of resources and population, resulting in widely differing situations with respect to the supply and availability of fish. This unevenness of distribution is also true of the infrastructural facilities required for handling and processing, which may be inadequate or even non-existent in some areas and substantially underutilized in others.

9. Exploitation of resouces is heavier in zones that are in closer contact with the European fleets or more accessible to them, and where fishery activities are more highly developed. The greatest potential for increasing the use of marine species is to be found in the Indian Ocean, while in the Mediterranean all the resources are well exploited and have in some cases been overfished (see table 1).

10. The existence of financial constraints is impeding the implementation of plans for the organization and expansion of fishery activities.

11. Many countries of the region have instituted no systems or standards of health inspection. Even where such standards do exist, they do not always find or permit effective application.

The ways in which fish are used

Taking the region as a whole, or even in the majority of the countries with a sizeable fisheries sector, there are two well differentiated patterns with respect to the use of fishery resources. The typical pattern is that of small-scale operations using non-industrial methods, whereas the most recent alternative involves large-scale industrial fishing and processing. This division is also very clear in terms of the types of products in question and the markets for which they are intended. The products consumed in the producing or neighbouring countries are obtained through the use of rudimentary techniques by individuals, families or groups, but when added together yield substantial quantities accounting for most of Africa's relatively high consumption. This consumption is as much as 14 kg per inhabitant/per annum in the West, representing 35 per cent of the total ingestion of animal protein in that area.

Table 1

Regions	Kg of whole fish per person/year		Percentage of total animal protein	
	1971/73	1981/83	1973	1983
West Africa	11	14	30	35
Central Africa	11	10	34	23
East Africa	6	5	14	13
Southern Africa *	7	9	9	11

Source: FAO, Food and Nutrition, Vol. 12, No. 2, 1986, p. 6

* Excluding South Africa

Furthermore, industrial or large-scale fishery activities have been developed basically through the use of fish of the tuna and shrimp variety for export, mainly to Europe. Industrial-scale fishery activities, including the catches, has expanded with the supply of technology and capital to the various mixed or foreign enterprises operating on the basis of various kinds of agreements, as summarized in annex I.

Considering comprehensively all the components present in the exploitation of the marine resources of the African coasts, it is fair to say that, with the exception of a number of non-coastal pelagic species, nearly the entire potential is being exploited and in some cases overexploited, notwithstanding the fact that catches in 1984 totalled only 4,044,975 tons as opposed to 4,420,667 tons in 1975. Some figures on the resources available may be seen in table 2.

Table 2

Potential and catches by groups of marine species in 1981

	Eastern-Central Atlantic	South-Eastern Atlantic	Western Indian Ocean a/	Mediterranean b/
Deep-sea pelagics				
Potential b/	(900)	(900)	(600)	(60)
Catches	250	40	180	60
Coastal pelagics				
Potential	2 500	2 000	2 200	800
Catches	1 850	1 680	750	1 060
Demersal fishes				
Potential	800	800	1 200	400
Catches	960	600	880	350
Crustaceans				
Potential	30	40	290	35
Catches	40	10	290	30
Cephalopods				
Potential	200	40	220	60
Catches	150	10	10	50

Sources: FAO (Robinson, FIDI/0772) and miscellaneous.

a/ West Ocean Indian and Mediterranean in their totality, including Africa.

b/ The potentials of deep-sea pelagics can refer only to a whole ocean. It should be noted that the catches in Africa represent one-third of the Atlantic potential.

Apart from some isolated cases, the situation is different with regard to the inland water resources, which are generally underexploited. Total continental fishery resources are in the order of 3.5 million tons, with catches in the order of 1.5 million. The fact that these resources are not more heavily exploited is due to a number of factors, such as environmental difficulties connected with accessibility and seasonal conditions, transport, the supply of fishing implements, security problems caused by warfare, etc. There have also been major changes in a number of the most important inland bodies of water, changes which, either a result of climatic factors or man-made structures, have discouraged fishery activities. Five countries of the Great Lakes region - Malawi, Uganda, Tanzania, Zaire and Zambia - account for 35 per cent of the inland water potential, with a production of 783,000 tons, representing 54 per cent of African inland water production.

Aquaculture is still underdeveloped, with nothing to justify the expectation of significant advances in the region, except in Nigeria, where it has been possible to produce 22,000 tons. Côte d'Ivoire appears to be the most promising country in this respect because of its favourable conditions for shrimp-raising in brackish waters and the fact that the national level of industrial and entrepreneurial development provides an appropriate climate for the implementation of projects of this kind. To date, fish culture has been pursued on a small scale in a number of countries.

Products, handling and processing (valorization)

Introduction

Unsurprisingly, the problems encountered in making proper use of fishery resources begin with the unselective nature of much of the fishing equipment and implements in use. In the case of the region's industrial-scale fisheries, the volume of fish rejected and returned to the sea is about 40 per cent of the total volume unloaded, with this figure rising to above 70 per cent in the case of shrimp. On this count, small-scale fishing operations are far more efficient with a rejection rate in the order of 15 per cent, although in terms of actual recovery an extremely weighty factor is the fish loss suffered by the small-scale operators due to inadequate conditions for on-board preservation.

Unloading facilities

It is characteristic of the region that the fish unloading points are concentrated at the principal multi-purpose commercial ports, where unrelated activities are carried out and the specifically fisheries-related installations are inadequate. As a general rule, the fishery facilities are designed more for import and export operations, but are less than satisfactory for handling the unloading of fish. It is frequently possible to find large-capacity cold-storage installations for frozen fish products, but no ice or storage chambers for fresh fish and, even less, adequate marketing and handling systems.

For example, along the East coast, where most of the fishery activities are concentrated, sufficient port capacity designed specifically for fish handling exists nowhere outside of Morocco, Senegal, Côte d'Ivoire and Cameroon. On the other hand, at a number of points there are oversized cold storage installations, as in Angola, at Port Saint-Louis in Senegal and in Cape Verde, which in some cases have been idle because of underutilization or lack of maintenance or in fact have never become operational, as in the case of the Bolimog facility in Somalia.

There is a well-documented general lack of fish reception facilities for what might otherwise be a modern operation using small-scale units, and also of the infrastructure for refrigeration and general logistical assistance to fishery operators, ranging from nets to motors and freezing equipment. Nevertheless, a number of efforts have been made to improve this situation, for example in Senegal, where, with Canadian financial backing, the Senegalese Small-Scale Fisheries Assistance Centre has endeavoured to organize marketing co-operatives with facilities for storage, handling, refrigeration and transport. In other countries too, the trend is towards the development of the concept of modern small-scale fisheries centres.

Facilities for handling and for processing or valorization

The processing infrastructure varies greatly as to type, but is limited, in the case of the industrial-scale fisheries operations, to canning, freezing and the production of fish meal and oil. The number and capacity of the installations on register are discussed in annex II (1), (2), (3) and (4).

The small-scale fisheries operations rely on the typical products of the region - salted, dried, smoked and fermented fish products in an extensive range of types and varieties.

Although all the figures for the region are of very relative accuracy, they are useful in suggesting the general picture. In this sense, it may be more worth while, for the purpose of gaining an idea of the socio-economic and dietary importance of the two approaches - small- or industrial-scale - to the exploitation of the continent's marine or inland resources, to consider in a general way the data reproduced in annex III on the distribution of employment.

From this information it follows that, if occasional employment is included, small-scale fishery activities provide jobs for nearly 20 times more inhabitants than do the industrial-scale fisheries. In addition, small-scale inland fisheries employ three-and-a-half times more persons than do the marine fisheries. It should be made clear that these figures, which include the fishermen, often fail to agree with data on the production levels achieved or on internal or external marketing, the reason being the extensive self-consumption that is mainly found in the areas in which the small-scale inland fisheries operate.

A number of West African countries, such as Senegal, Ghana and Côte d'Ivoire, have in recent years installed canning plants with the capacity to produce large quantities of tinned tuna, mackerel and sardines. The technology used in these canneries, which rely on external - mainly French - assistance, is good. The interest of the French processors was attracted to these locations because of the availability of the necessary raw materials, and special commercial arrangements were concluded to support the general operations and to make them profitable and attractive.

This zone has also seen an expansion of the refrigeration industry, the basis for which is the need to preserve the frozen products that certain countries, such as Nigeria and Liberia, import in substantial quantities. At the same time, a number of distribution networks have been put into place in the interior. The cold-storage facilities are also used for the preservation of frozen export products, such as tuna, hake, cephalopods, shrimp and lobsters.

Product types

A. Industrial-scale fishery products

Essentially, industrial-scale fishing and fish processing has been carried out by the ships of third countries that have for many years operated in African waters. The impossibility of freely fishing in national waters has prompted the various countries involved in these operations to conclude agreements, which have acquired various forms (see annex I), with the riparian States. Since the introduction of the concept of the exclusive economic zone (EEZ) by the coastal countries, foreign capital has also discovered an incentive for participation in local land-based production undertakings - with the advantage of low wages and the problem of unskilled labour - by establishing mixed enterprises or sharing in a variety of ways in local investments. Ultimately, these arrangements have given rise to a sizeable local production sector for canned goods, frozen products and for fish meal and oil. The output of this sector has been allocated for supplying the markets both of the third countries that originally helped to initiate it, and of others as well, a fact that explains the great difference between these products and those typically consumed by the local population.

There is no need to describe in detail the characteristics of these industrial-scale fishery products, since, given that they are ultimately intended for export, they are in accordance with international marketing requirements.

B. Small-scale fisheries products

In the case of nearly all the fish consumed in Africa, preparation is according to the traditional methods of drying, salting and smoking or various combinations thereof. Out of the total fish supply for the African population, which consumes about 8 kg of fish per capita/per annum, imports account for not more than about 10 per cent, but even these products are occasionally dried and smoked before consumption when imported in frozen form.

It would be hazardous to state that the African people prefer dried fish to the fresh kind. Drying or salting is in many cases the only realistic alternative if the fish - which must be stored, manually transported and marketed under very adverse environmental conditions - are not to be lost. In any case, this practice is today regarded as an element of the indigenous culture, so that in certain regions more than 80 per cent of the fish is lightly salted and sun-dried. It is also true that for some peoples there is a taboo on the consumption of fish that has not in some way been processed.

It is a simple matter to list the products in general terms in accordance with the kind of processing they have received, independently of the species or type of fish involved.

1. Fresh. Normally without ice, under natural conditions and whole.

2. Dried. Sun-dried, whole or cut in different ways; normally gutted tuna with the head.

3. Salted. Mixed with salt, lightly salted.

4. Salted and dried. Lightly salted and then sun-dried to different degrees.

5. Smoked. Relatively cold smoking.

6. Smoked and dried. Smoked in a way also known as grilling.

7. Salted, smoked and dried. A combination of the foregoing.

8. Fermented. Sui generis, according to region.

In reality, the preservation methods differ widely, although they are generally covered by the techniques listed above. They range from the immersion of the fresh fish in the mud of the shoreline for the purpose of maintaining a lower temperature, to practices that, although applied on a small scale using very simple means, are far more effective. When the various methods are used with different types of fish, the resultant products are quite different.

Handling and processing for adding to the value of the fish

The discussion here will be concerned only with those particular characteristics of the small-scale processing techniques that in some way distinguish them from the methods most commonly employed throughout the world. Accordingly, freezing, canning and the production of fish meal will not be considered, although a few comments on these subjects will be offered.

On the question of the fish-meal production facilities, it need only be noted that, because these plants are not engaged in producing a food for human consumption - the reason being that the sale of this product has become unprofitable in the international market, and owing also to the inadequate supply of raw materials - they have greatly cut back their production and are today in many cases standing idle. Generally speaking, their machinery and equipment is not up to date.

With respect to canning activities it is important to point out that there are a number of small plants that market their products mainly on the continent, but that are facing serious problems in connection with the guarantees they are required to give with respect to these products. One of the principal problems, in addition to the shortage of skilled technical personnel, has to do with the containers and their sealing properties.

In many major cities of the West African region, such as Dakar, Abidjan and Accra, large canneries have been built - especially for the tinning of tuna - for which there is no assured future supply of fish.

Because of their poor quality, a large proportion of the canned products produced can only be sold locally or at very low prices.

The development of the refrigeration industry began in the 1960s in Ghana, Liberia, Nigeria, Senegal and Côte d'Ivoire, where storage facilities are now available. These installations are used for import operations and for pre-export storage. There are also facilities for freezing by the cold-air, contact and brine-immersion methods. Very often the frozen products are not maintained at the proper temperatures, with no distinction made between a temperature of -10°C and -20°C as it applies to the preservation of the fish. In any case, the intention is always to sell the fish in fresh form, as this is preferred. The loss of cold or thawing normally occurs during the final distribution phase.

A very serious problem at all these installations is maintenance, for it is almost impossible to obtain spare parts or trained labour. For this reason, the Governments are in many instances committed to improving the traditional methods of salting and drying rather than to encouraging the use of refrigeration techniques.

Many countries today are still searching for better solutions of the kind that will provide a sectoral development model more effectively geared to regional conditions.

The handling of fresh fish 1/

Generally speaking, the climatic conditions throughout the entire continent are extremely unfavourable. This, coupled with the lack of good communication arteries, refrigerated storage facilities, cold chains and even ice, makes it very difficult to maintain the quality of fresh fish, which is often badly spoiled even by the time it reaches the unloading pier. In many cases, care is not even taken to observe the practice of keeping the fish wet while exposed to the sun on the small fishing vessels or of covering it with a moist cloth so as to lower its temperature. Once the catch has been brought ashore, it is common to find that there is no water of drinkable quality with which to wash it and that no cooling facilities are available. When vehicles are used for transport, they are normally not clean, or else the fish, carried on the heads of women under an intense sun, must withstand long journeys. In many places, however, the various technical and material assistance projects are insisting on the introduction of plastic cartons and insulated containers and on the use of ice.

When ice is used, the preferred form is in large bars that are manually cut, the reason being that ice keeps longer in big pieces, although at the same time it obviously cools less effectively and, worst of all, non-uniformly, with much of the potential benefit lost in this way. A considerable advance can be seen in the fact that in Dakar a number of purse seiners use cooled sea water for the preservation of their sardine catches. Nevertheless, machines designed to produce shaved ice are gradually being introduced.

1/ Information extracted from: Ko Watanabe, "A Review ...", INFOFISH Marketing Digest, No. 185 and others, and personal experience.

Salting, drying and smoking

Independently of the possibility of categorizing the products of this group among the types indicated previously, the range of possibilities is very large. More than on the adaptability of the individual species, the variations are based on the economic aspects of the process under various climatic conditions and on the availability of the necessary means.

One of the most rudimentary methods, encountered in the region of Lake Tanganyka, is the sun-drying of the whole fish. When wood is available and it is necessary to speed up the drying process, the wood is normally burnt to provide hot drying in what might be regarded a an incipient smoking process in which the preservative effect derives from the semi-cooking and the loss of water. Depending on the conditions, the times and temperatures used for the drying and smoking - or grilling - vary widely. If salt is available and at least a light preliminary curing is possible, the drying requirements will be less stringent. Simple sun-drying is used in the driest zones, such as the Sahel or Central Africa during the dry season, although preliminary salting is also preferred when fatty species are used, and the drying is in any case a slow process in regions other than those with a climate as dry as Angola's. On the other hand, grilling is preferred in very humid zones or during less favourable seasons.

Therefore, according to the consumers' preferences, the size of the fish and the prevailing climate, the drying process may differ and vary in duration from one to 12 days. In the particular case of the much-favoured sea-cucumber, which is prepared by boiling and drying, the drying process may be more extensive.

The final water content may range from 10 per cent in the dry sardines of Lake Tanganyka to 40 per cent in preliminarily salted products in Angola and 60 per cent in the grilled fish products of Ghana.

The physical arrangements used for drying the fish are extremely varied and extend all the way from allowing them to remain undisturbed on the floor for the required time, to hanging them up carefully in a place inaccessible to animals and insects.

A variety of open or closed stoves, adapted to local conditions and materials, are used in drying and smoking the fish. Open, closed, semiclosed, altona-type, barrel-shaped and other systems are employed for this purpose.

In some places, such as southern Angola, along the coast, there are fish salting and drying facilities that during the 1970s used as much as 300,000 tons/year of small pelagic species in a five-day medium salting process (salt ratio of 1:3), followed by sun-drying with the fish sections extended over doubly inclined racks (the fish was scaled in advance). This case is particularly interesting because, although the method does not greatly differ from the small-scale processing technique (and should in fact be regarded as such), it was implemented on a large, industrial scale. At present, the facilities, which have remained virtually idle for a period of years, are being restored. The plants, which even have their own wharves and unloading systems, were shut down for lack of fish and salt.

In other countries, salting was promoted as a method of preservation beginning in 1960, the purpose being to salt the fish slightly (10-15 per cent), thereby improving its stability. The product gained acceptance, but was generally abandoned when, beginning in 1970, the necessary supply of salt could no longer be ensured.

Fermentation

It is mainly in Senegal and Ghana that lightly salted and semidried fermented products are produced. The distinctive flavour and characteristic aroma are responsible for their use in small quantities as condiments in certain dishes. In Senegal, the sheat-fish and other species are opened, gutted, salted and fermented in special wooden receptacles that appear to retain the bacteria necessary for the fermentation process. Another method involves the autolysis of the whole fish covered with sand under the sun, after which it is salted and sun-dried.

In Ghana, fish that have lost their quality for fresh consumption are used. Salt is added and the fish are allowed to ferment in a kind of cavity for a few days, after which they are dried moderately in the sun. In Côte d'Ivoire, one finds "nuoc-mam", a kind of Vietnamese sauce, the industrial-scale production of which is currently being introduced. Products of this kind are not very familiar in Central and Eastern Africa.

The problem of containers and packaging

The demanding climatic conditions of Africa, the abundance of insects and the high relative cost of packaging confront the region with a set of problems for which it is difficult to find local solutions.

There is a very high percentage of product loss due to problems connected with environmental conditions and with the handling which the products must undergo once they have been obtained from the sea. Accordingly, packaging is a key factor in determining the feasibility of developing the continent's internal markets.

In general, the means used for the storage and transport of the region's typical products barely serve their purpose as "containers" and cannot be regarded as adequate packaging, since they are unable in most cases to protect their contents against attack by insects and animals.

Even canned goods are circulated in packaging manufactured from imported raw materials, a practice that has an exaggerated effect on the cost of the products.

Product and technology development

In the same way that, as we have noted, there has not yet emerged a clear definition of the kind of fisheries development policy best suited to the countries of the region, so too there is still much to be done in terms of identifying the most appropriate products and technologies.

Against the background of the experience that has already been gained through major undertakings in the industrial fish meal, canning and freezing sectors, there now appears to be an incipient trend back to the processes with long traditions in the region.

This would seem to be a valid alternative, considering that:

1. It has become clear that there are major shortages of the kind of skilled technical personnel required for the industrial-scale practices discussed above.

2. Technical assistance is burdensome and it is very difficult to ensure the availability of critical spare parts when needed.

3. The high investment level required for these industrial-scale undertakings can throw the system out of balance.

4. It has been demonstrated in the discussion to this point that tnere are many improvements to be made in the techniques for the production of traditional products.

5. Given that the degree of resource exploitation is close to maximum, development must be gradual and cautious, and under the control of the riparian countries.

Nevertheless, a number of new areas are being explored, such as high-protein concentrates, meal for human consumption and fish silage. The idea of producing fish meal or high-protein concentrates is not new, but is still under consideration by a number of African countries that are seeking the right conditions for putting it into effect. In the light of our previous analysis, it would not appear to be an interesting variant at a time when there are more environmentally suitable economic alternatives.

One approach tnat would appear to have possibilities within the terms of reference described in this paper is the alternative of producing fish silage, particularly if carried out biologically, as this is a simple process that neither requires machinery nor involves problems of scale.

Another major area for the development of alternatives that could lead to constructive technological contributions might be that of containers and packaging, with the aim of minimizing the very substantial product losses caused by insects and the effects of other environmental factors.

Marketing

The role of fish in the people's diet varies greatly from one African country to another and within each country, as well as from one region to another. For example, in Senegal consumption is as much as 45 kg per inhabitant along the coast and 7 kg in the East. At the national level, consumption ranges from 40 kg/year in Senegal and Ghana to 0.2 kg in Ethiopia and Rwanda.

Leaving aside these particular situations and considering the continent as a whole in terms of the evolution of fish imports and exports, we find that, expressing the annual respective amounts in United States dollars, the situation is as follows:

	1982	1983	1984
Exports	617	719	692
Imports	1 168	892	674

Source: FAO: FII/0782, Suppl.

This means that in continental terms Africa has achieved equilibrium in its fisheries trade balance, even though it is necessary to keep in mind that this has come about as a result of a decrease in imports due to the economic crisis and not to any major growth in exports, which have in fact risen only slightly during the period in question. Estimated figures for 1985 covering production, exports and imports for each country are considered in detail in annex IV.

The Western Zone (of CEFAC) is characterized by a significant level of fishery activities and a per inhabitant consumption level well above the continental average, the figure for 1980 being 12.8 kg/year, of which 5.1 kg were accounted for by local production and the remaining 7.7 by imports. 1/

This zone exported fish worth $US 87 million to developed countries and imported from these countries an amount worth $US 131 million. On the other hand, trade with countries of the zone amounted to $US 28 million for imports as opposed to $US 31 million for exports. This is an indication of the relative importance of North-South trade in comparison with South-South commerce.

The major importing countries are those that, with limited production of their own, have the largest populations and are located on the Gulf of Guinea, such as Nigeria, Côte d'Ivoire, Togo, Cameroon, Gabon and the Congo. Further to the north, where there is more production, the import level is lower. Cape Verde and Morocco import practically nothing. The situation is different in Senegal, Mauritania and the Canary Islands, where imports are generally re-exported.

With regard to the exports from this region, nearly all the countries along the coast export shrimp, but the largest exporter of this product is Senegal. The Canary Islands are a major exporter of cephalopods to Japan, Greece and Italy. Other export products are sardines and tuna, the major exporters of which, in the form of canned goods, are Morocco, Côte d'Ivoire, Senegal, Ghana and the Canary Islands. Mauritania is the largest exporter of frozen fish. In regional terms, Côte d'Ivoire is the major buyer, absorbing 60 per cent of Senegal's frozen fish exports.

Internal marketing and distribution

Many countries, such as Guinea Bissau, Guinea, Angola, Burundi and Tanzania, operate official price systems with the general consequence that there are serious distortions in the form of parallel markets with disproportionate prices. The effect of this is to impoverish the producers and enrich the middlemen. Supply too is greatly affected, with constraining effects on consumption.

In other countries the prices are established by the market as a function of the availability of foods and economic resources.

With regard to the distribution of fish inside the individual countries, this depends on the communication systems, which are in most cases inadequate, a fact that greatly limits consumption, as indicated by the per capita statistics.

Fresh fish is consumed only in the areas near to where it is caught, and must be processed if it is to be transported to the interior. Even when the fish is processed into a salted, dried or smoked form, the packaging problems discussed above result in major losses during distribution.

One factor that must be kept in the forefront of consideration is the preponderant role of women in the processing, distribution and sale of fish, in all its forms, within the interior.

1/ It needs to be borne in mind that a substantial part of what appears in the statistics as imports in fact originates from catches made in national waters by foreign vessels. See INFOFISH Marketing Digest, No. 5, 1985.

Promotion of internal consumption

In Africa, no specific policies are needed to promote the consumption of fish in the way, for example, such measures might be required to encourage other social and economic developments or consumption habits. The African people are good potential fish-consumers. All that is required is that fish should be made available to the consumer through improved supply arrangements. As noted above, in one and the same country that part of the population that normally has access to fish exhibits what must be regarded as a high consumption level, but sometimes only a few kilometres away there may be communities that rarely ever enjoy this product.

Conclusions

- There is a need for clear-cut definitions of all the product types, scales of production and technologies most appropriate for the continent.

- The training of human resources is required in order to achieve progress towards greater self-sufficiency in the operation of fishery systems, on both the small and the industrial scale.

- Priority attention must be given to improving handling and processing techniques in connection with the small-scale production of the traditional fish products used in supplying local markets.

- More effective use should be made of the existing infrastructural assets, and it is necessary to provide additional zones with the indispensable facilities, taking into account the criterion of regional co-operation.

- Women play a key role in fishery activities throughout the region.

- Improvements are needed in the packaging, transport and distribution of fishery products within the interior of the continent.

- It is necessary to promote the more widespread use of ice under appropriate conditions.

- It is essential that there should be proper maintenance of the existing installations and those being built, inter alia, by adopting working methods that do not create difficulties in this area.

- For the purpose of promoting domestic consumption, it would be useful to improve the existing marketing and transport systems so as to achieve better distribution, and to encourage the construction of premises suitable for the storage of fishery products.

- The systems for the gathering of production and marketing data must be improved.

- Countries must develop markets for their most important fishery export products through their own channels.

- There are excellent prospects for improving and increasing interregional trade.

- The adoption of a standard fish nomenclature for the entire region would be extremely useful.

- There is a need, especially for those countries that aspire to gain a respectable share of the international market, to institute official quality-control and health inspection standards.

Principal obstacles to the improvement of the African fisheries system in the technological area

A. In the industrial-scale sector

- Lack of maintenance and inadequate supply of spare parts;
- Frequent electric power failures and problems in the supply of fuel, water, ice and salt;
- Training of skilled personnel;
- Lack of the necessary infrastructure (communications, water, energy, etc.);
- Selection of inappropriate technologies and scales of production;
- Problems in the supply of such basic inputs as water, salt, ice and packaging.

B. In the small-scale sector

- Inadequate preservation facilities on board the fishing vessels;
- Problems in infrastructural maintenance;
- Lack of on-shore infrastructure (unloading facilities);
- Need for improvements in handling;
- Unsatisfactory packaging;
- Lack of storage facilities;
- Lack of adequate distribution systems;
- Lack of transport facilities;
- Need to reduce post-capture losses throughout the entire production and marketing cycle.

Annex I

(Carroz and Savini, March 1985)

Fisheries and other agreements by African coastal countries

	West African States		Other States	
	Intergovernmental agreements	Arrangements with enterprises	Intergovernmental agreements	Arrangements with enterprises
Angola	Congo (1977); Sao Tome and Principe (1980)	Cape Verdean enterprise	Cuba (1976); USSR (1976, protocols of application renewed annually); Spain (1980 and 1983)	Group of French ship-owners
Benin			France (1961 and 1975); USSR (1977)	Libyan enterprise
Cameroon	Equatorial Guinea (1973 and 1981); Gabon (1974)			Danish, French, Spanish and United States enterprises
Cape Verde	Senegal (1982)	Cape Verdean public enterprise with Angola	Portugal (1980); Spain (1981)	Spanish ship-owners; French enterprise
Congo	Gabon (1971 and 1982); Angola (1977)		France (1974)	Italian enterprise; French and Spanish ship-owners
Côte d'Ivoire	Liberia (1972); Mauritania (1974); Senegal (1976, 1977 and 1979)	Ivorian company with Mauritania; Senegalese and Moroccan enterprises	France (1961)	Japanese, French, Italian and Spanish enterprises
Equatorial Guinea	Cameroon (1973 and 1981); Nigeria (1981)		USSR (1973); Spain (1979); EEC (1984)	Spanish and Soviet enterprises
Gabon	Congo (1971 and 1982); Cameroon (1974); Sao Tome and Principe (1975)		France (1960 and 1974)	Spanish shrimp-boats; Japanese and French enterprises
Gambia	Senegal (1967 and 1982)	Mixed companies with Ghanaian enterprise	USSR (1975); Republic of Korea (1976)	Japanese enterprise
Ghana	Mauritania (1974); Guinea (1978)	Ghanaian enterprise with Gambia and Guinea	USSR (1963)	United States, Japanese and Japanese-United States enterprises
Guinea	Ghana (1978); Guinea-Bissau (1980); Nigeria (1980)	Liberian and Ghanaian enterprise	USSR (1966 and 1981); Romania (1974); German Democratic Republic (1976); Libya (1977 and 1978); Greece (1978 and 1979); Spain (1983 and 1984); EEC (1983)	Greek, Italian, Japanese, Spanish, United States and Yugoslav enterprises
Guinea Bissau	Senegal (1978 and 1982); Guinea (1980)		Algeria (1975); USSR (1975, protocols of application renewed annually); German Democratic Republic (1976); Libya (1976); France (1977); Portugal (1977); EEC (1980, extended twice in 1982 and amended in 1983); Spain (1984)	Italian equipment; Algerian, French, Japanese, Libyan, Portugese and Soviet enterprises

Annex I (cont.)

	West African States		Other States	
	Intergovernmental agreements	Arrangements with enterprises	Intergovernmental agreements	Arrangements with enterprises
Liberia	Côte d'Ivoire (1972)	Libyan and Guinean enterprise; Sierra Leonean enterprise		United States, Korean and Sierra Leonean enterprises.
Morocco	Mauritania (1970, 1976, 1978, 1979) (status uncertain)	Enterprises of Sierra Leone and Côte d'Ivoire	Spain (1969, 1974, 1977, 1979, 1980, 1981, 1982); France (1972); Portugal (1976); USSR (1978)	Belgian, Korean, United States, Spanish, Italian, French, Portuguese and Kuwaiti enterprises
Mauritania	Côte d'Ivoire (1974); Ghana (1974); Morocco (1970, 1976, 1978 and 1979) (status uncertain;) Nigeria (1974, 1976, 1982); Senegal (1974, 1980, 1983)	Ivorian and Nigerian companies	Algeria (1973); Bulgaria (1971); Republic of Korea (1981 and 1983); Egypt (1964 and 1967); Spain (1964, 1977, 1978, 1982); France (1961, 1975, 1976); Greece (1966, 1969, 1974, 1977); Iraq (1979); Italy (1969); Libya (1977, 1978 and protocols of applications); Poland (1975); Portugal (1976 and 1984); Romania (1974 and 1981); USSR (1973, 1978 and 1980); Tunisia (1984)	Algerian, United States, Bermudan, Bulgarian, Korean, Egyptian, Spanish, French, Iraqi, Italian, Japanese, Kuwaiti, Libyan, Norwegian, Polish, Panamanian, Portuguese, Romanian, Swedish and Soviet enterprises
Nigeria	Mauritania (1974, 1977, 1982); Equatorial Guinea (1981); Guinea (1981); Senegal (1982)	Mauritanian enterprise		Kuwaiti, Japanese, United States, Norwegian, Polish and Spanish enterprises
Sao Tome and Principe	Gabon (1975); Angola (1980)		Portugal (1979); USSR (1981); EEC (1984)	
Senegal	Gambia (1967 and 1982); Côte d'Ivoire (1976, 1977, 1979); Guinea Bissau (1978 and 1982); Nigeria (1982); Cape Verde (1982); Mauritania (1974, 1980, 1983)	Ivorian enterprise	USSR (1965); Spain (1972, 1974, 1975, 1979, 1982); France (1960 and 1974); Italy (1975); Poland (1976); EEC (1979, extended and amended in 1982 and 1983, 1984)	French, Italian, Polish, Japanese, Swiss, Belgian, Korean, Soviet, Spanish and Danish and United States enterprises
Sierra Leone		Liberian enterprise, Sierra Leonean company with Morocco	Yugoslavia (1975); USSR (1976 and further protocols of application)	Japanese enterprise
South Africa			Japan (1977); Israel (1978); Portugal (1979); Spain (1979)	Spanish enterprise
Togo				Libyan enterprise
Zaire				

Source: Regional Report. Weber and Durand, UNIDO, 1986.

Annex II (1)

On-board handling. On-shore facilities

Countries	On-board handling Ice	Freezing	Main and secondary unloading points	Repair yard
Algeria				X
Angola				
Benin		12	1	
Botswana				
Burkina Faso				
Burundi				
Cameroon	17	17	4 (45-90)	X
Cape Verde			2-4	1
Central Africa				
Chad			6 to 20 (lake level)	
Comoros			100-140	
Côte d'Ivoire			3	2-6
Congo	15		1 (16)	X
Djibouti				X
Egypt				X
Equatorial Guinea			5	
Ethiopia				
Gabon	14	13	2	X
Gambia	115	115	1 (12)	1
Ghana		41	3	X
Guinea	65	65	1 (80)	X
Guinea Bissau		4	3	2
Kenya				X
Lesotho				
Liberia	8	10	4 (20)	1
Libya				X
Madagascar			8	
Malawi			10 (6 on Lake Malawi)	
Mali			1	X
Mauritania	36	14 + 50	1 (18)	0
Mauritius			(64)	
Morocco				X
Mozambique			5	?
Namibia			2 (Walvis Bay for 93%)	X
Niger				X
Nigeria				
Reunion				
Rwanda				
Sao Tome and Principe			6	X
Senegal	192	50	10 (160)	7
Seychelles			36	
Sierra Leone		5	1	1
Somalia				
South Africa				
Sudan				
Swaziland				
Tanzania	12			X
Togo	18	18	1	
Tunisia				
Uganda				
Western Sahara				
Zaire				
Zambia				
Zimbabwe				

Annexes II (1), (2), (3) and (4) from
Regional Report, Weber and Durand, UNIDO, 1986

Annex II (2)

On-shore cold handling facilities

Countries	Ice factories		Freezing units		
	Number	Capacity (tons/day)	Number	Capacity (tons/day)	Production (tons/year)
Algeria					
Angola					
Benin		30		16	800 (crustaceans)
Botswana					
Burkina Faso					
Burundi					5 000 (industrial-scale fisheries)
Cameroon		35 - 200?		10 (for 55 theoretical)	
Cape Verde		20	3	80	
Central Africa					
Chad					
Comoros	3	30	3	15	800
Côte d'Ivoire	2	300 + 10	4	90	
Congo	1	60 - 90		0	
Djibouti			x		
Egypt			x		
Equatorial Guinea				0 (for 2 theoretical)	
Ethiopia	2	25			
Gabon	2	60		0 (for 20 theoretical)	
Gambia	1	50 - 60	2	90	
Ghana	2	80			
Guinea	1	30			
Guinea-Bissau	2	80	1	65	
Kenya			x		
Lesotho					
Liberia		30		20	200 (shrimp)
Libya					
Madagascar	5	85	12	220	
Malawi	1	10			
Mali	x	5	1	4	
Mauritania	6	150 - 200	8	200 - 300	
Mauritius					
Morocco					
Mozambique			1		
Namibia			x	5 000	
Niger					
Nigeria			2		x (shrimp)
Reunion					
Rwanda	1				
Sao Tome and Principe		3 (for 15th)			
Senegal		220	35	1 000	
Seychelles			x	5	100
Sierra Leone	1	80		75 - 105	
Somalia					
South Africa					
Sudan					
Swaziland					
Tanzania	x	16	x	16	
Togo	2	40			
Tunisia	x		x		
Uganda					
Western Sahara					
Zaire			x		
Zambia	x		x		

Annex II (3)

On-shore cold-handling facilities

Countries	Frozen storehouses			Chilled storehouses	
	Number	Capacity (tons or m^3)	Location	Capacity (tons or m^3)	Location
Algeria					
Angola					
Benin		7 500 tons of which 1 500 tons fish and 1 000 tons	Coast and interior	800 tons	
Botswana					
Burkina Faso					
Burundi					
Cameroon	44	3 000 to 9 000 m^3 + 1 800 m^3	Douala and other sites	500 m^3	Douala
Cape Verde	8	14 000 m^3	Mindelo	100 - 400 tons	
Central Africa					
Chad					
Comoros	4	100 tons			
Côte d'Ivoire	120+40	7 500 tons + 1 500 tons	Abidjan and other sites	6 000 m^3	Outside of Abidjan
Congo	8	5 000 m^3+2 000 tons	Pte Noire and other sites	2 000 m^3	Pointe Noire
Djibouti	x				
Egypt					
Equatorial Guinea	2	800 - 1 000 m^3		500 - 1 000 m^3	
Ethiopia					
Gabon	4	2 000 m^3	Libreville	1 000 m^3 + 300 m^3	Libreville and Pointe Gentil (tuna)
Gambia		1 500 tons		100 tons	Banjul
Ghana		6 000 m^3 utilized/ 20 000 m^3 total		20 000 tons	ACCRA-TEMA
Guinea	2	3 600 tons		450 tons	
Guinea-Bissau	3	2 800 tons		600 - 800 tons	
Kenya					
Lesotho					
Liberia	15	2 000 tons + 500 tons	Monrovia and interior		
Libya					
Madagascar	2	2 000 tons			
Malawi	4	300 tons			
Mali	x	20 tons	Mopti		
Mauritania	10	15 000 to 20 000 m^3			
Mauritius	x	1 200 tons			
Morocco					
Mozambique	2	3 000 tons	Maputo, Beira		
Namibia					
Niger					
Nigeria				120 000 tons	
Reunion					
Rwanda					
Sao Tome and Principe		160 m^3		100 - 200 tons	
Senegal	35	12 000 to 17 000 tons		8 000 tons	Dakar, coast, interior
Seychelles	x	1 000 tons + 400 tons planned (tuna) and 300 tons + 5 000 tons planned			
Sierra Leone		3 300 tons + 200 tons	Freetown and 8 villages	450 tons	
Somalia	3	1 600 tons	Mogadishio, Kismayo, Bérbera		
South Africa					
Sudan					
Swaziland					
Tanzania	x	200 tons			
Togo	15	1 000 tons + 2 000 tons	Lomé and other sites	180 tons	9 villages
Tunisia	x				
Uganda					
Western Sahara					
Zaire	x				
Zambia	x				
Zimbabwe					

Annex II (4)

On-shore handling: other than cold

Countries	Canning				Meals				Salted-Dried-Smoked other than small-scale			Miscellaneous			
	No.	Capacity	Production	Location	No.	Capacity	Production	Location	No.	Capacity	Production	Location	No.	Capacity	Nature
Algeria															
Angola															
Benin									1		2 300				
Botswana															
Burkina Faso															
Burundi									4						
Cameroon									6						
Cape Verde															
Central Africa									X		400				
Chad															
Comoros															
Côte d'Ivoire	2	150-200	16 000 tuna + 9 000 others		1+1	3 000 + 80 000 hydrolysate									
Congo															
Djibouti															
Egypt	X														
Equatorial Guinea															
Ethiopia					2	75 000	Shut down								
Gabon									22		1 500	Gunjur			
Gambia															
Ghana	2	25													
Guinea	X	10							X				X		Cleaning, Packaging
Guinea Bissau															
Kenya	1			Mombasa	X										
Lesotho															
Liberia					X	200			X		6				
Libya	5		200 tuna + 400 sardine												
Madagascar															
Malawi															
Mali									X		20-30				
Mauritania	1	20		Nouadhibou	2	75 000	2 000		2		1 000	Nouadhibou			
Mauritius															
Morocco															
Mozambique	1			Maputo					1	+ Machava salting project 300 000 ton by catch shrimp					
Namibia	5	400	17 000		8	200 000	80 000								
Niger															
Nigeria															
Reunion															
Rwanda															
Sao Tome and Principe									1	70	0 (not in operation)				
Senegal	3	200-500	20 000		2	70 000							1	25	Filleting
Seychelles															
Sierra Leone					1	10 000									
Somalia	4	5 ?	200	Paskoreh Habo Candola											
South Africa															
Sudan															
Swaziland															
Tanzania					X	5 000 in progress			1						
Togo															
Tunisia	X	5-15			X										
Uganda															
Western Sahara															
Zaire															

Annex III

Employment in fisheries in Africa

Countries	Population (millions)	Continental	Maritime	Total small-scale	Occasional	Industrial-scale	Total fisheries
Algeria	21.5						
Angola	8.8			7 500		500	8 000
Benin	3.9	5 000	2 900	7 900	16 000	100	8 000
Botswana	1.15			1 000			1 000
Burkina Faso	6.8	450	0	450	10 000	0	450
Burundi	4.6	4 675		4 675			4 675
Cameroon	9	20 000	11 000	31 000		500	31 500
Cape Verde	0.4	0	2 610	2 610	830		3 440
Central Africa	2.5	650	0	650	4 500	0	650
Chad	5	100 000	0	100 000		0	100 000
Comoros	0.44		8 000	8 000			8 000
Côte d'Ivoire	8.5			19 000		1 000	20 000
Congo	1.7	8 000	650	8 650		300	8 950
Djibouti	0.35			80	250		80
Egypt	29.4			80 000	300 000	20 000	100 000
Equatorial Guinea	0.3	400	1 300	1 700		0	1 700
Ethiopia	34						
Gabon	0.7			4 600	3 000		
Gambia	0.6			1 400		150	1 550
Ghana	12						110 000
Guinea	5.4		8 000			500	8 500
Guinea Bissau	0.9			2 700		300	3 000
Kenya	19.7	16 000	3 000	19 000			19 000
Lesotho	1.5	200	0	200		0	200
Liberia	2.15			2 700		200	2 900
Libya	3.1	0	700	700		300	1 000
Madagascar	9.7	20 000	5 000	25 000		500	25 500
Malawi	6.9	10 000	0	10 000		500	10 500
Mali	7.8	70 000	0	70 000		0	70 000
Mauritania	1.9		1 000	6 000		1 000	7 000
Mauritius	1	0	2 500	2 500		500	3 000
Morocco	23.5		8 000	8 000		5 500	13 500
Mozambique	13.85	10 000	6 000	16 000		2 500	18 500
Namibia	1.55						
Niger	6	4 000	0	4 000		0	4 000
Nigeria	80						
Reunion	0.58						200
Rwanda	6	2 000	0	2 000			2 000
Sao Tome and Principe	0.09		1 600	1 600			1 600
Senegal	6.5	10 000	27 000	37 000	10 000	3 600	40 600
Seychelles	0.07		720	720		120	840
Sierra Leone	3.5						
Somalia	5.6		2 600	2 600		200	2 800
South Africa	31.4						
Sudan	20.9	6 000	400	6 400		0	6 400
Swaziland	0.65	100	0	100		0	100
Tanzania	20.9	40 000	19 000	58 000		450	58 450
Togo	2.85	6 000	2 250	8 250		30	8 280
Tunisia	7.5			5 500		2 500	8 000
Uganda	15.2						35 000
Western Sahara							
Zaire	31.2	60 000	1 500	61 500		50	61 550
Zambia	6.5	15 500	0	15 500		0	15 500
Zimbabwe	8	1 000	0	1 000		0	1 000
TOTAL	504.03	409 975	114 730	646 185 (?)	1 600 000	41 300	836 915

Source: Regional Report, Weber and Durand, UNIDO, 1986.

Annex IV

National production and foreign trade. Estimate for 1985.
Weight in tons. Value in millions of $US (FAO and other sources)

Countries	Total production	Exports (tons)	Imports (tons)	Apparent consumption	Value of production	Exports $US	Imports $US
Algeria	75 170						
Angola	425 000						
Benin	20 000	0	15 000	35 000	13.7	0	7.8
Botswana	1 500	0	1 600	3 100	0.7	0	1.8
Burkina Faso	7 000	0	3 500	10 500	5.25	0	1.56
Burundi	12 000	0	200	12 200	5.8	0	0.21
Cameroon	64 320	7 000	18 500	75 820	21.3	4.68	6.01
Cape Verde	9 131	1 400	0	7 731	3	2.1	0
Central Africa	13 360	1 000	1 200	13 560	12.9	0.7	0.5
Chad	110 000						
Comoros	4 000	0	1 000	5 000		0	0.4
Côte d'Ivoire	84 025	46 900	111 700	148 825	28	35.4	44.5
Congo	34 545	13 000	48 000	69 545	21.5	1	18.55
Djibouti	425	0	0	425	0.48	0	0
Egypt	72 000	400	80 000	151 600	21	0.9	22
Equatorial Guinea	4 000				0.88		
Ethiopia	3 900	0	300	4 200	1	0	0.1
Gabon	15 510	200	14 000	29 310	11.64	0.38	7.09
Gambia	18 300	4 800	600	14 100	4.75	0.93	0.17
Ghana	238 620	35 300	10 700	214 020	49.24	3.65	1.35
Guinea	20 000	0	16 500	36 500	1.42	0	3.7
Guinea Bissau	3 400	2 300	400	1 500	1.01	4.2	0.2
Kenya	92 440	2 200	5 200	95 440	13.26	2.6	0.9
Lesotho	32	0	2 000	2 032	0.014	0	2.3
Liberia	14 705	1 000	14 300	28 005	3.08	4.3	3.3
Libya	7 800	0	40 600	48 400	20	0	32.6
Madagascar	56 413	5 800	0	50 613	22.85	18.4	0
Malawi	70 070	2 300	1 000	68 770	10.65	2.1	0.65
Mali	60 000	1 200	250	59 050	17.9	0.63	0.27
Mauritania	52 024	69 500	61 500	44 024	12	98.35	13.8
Mauritius	9 525	6 300	16 800	20 025	6	5.9	8.5
Morocco	467 750	104 000	150	363 900	104.8	74.85	0.04
Mozambique	42 950	9 800	13 200	46 350	12.5	20	5.2
Namibia	162 600						
Niger	8 000	500	1 500	9 000	6	0.32	1.4
Nigeria	202 000	1 000	350 000	551 000		1.2	235
Reunion	2 870						
Rwanda	1 300	0	0	1 300	0.46	0	0
Sao Tome and Principe	4 290						
Senegal	275 100	91 000	1 000	185 100	90	120	1.2
Seychelles	52 700						
Sierra Leone	41 505						
Somalia	18 000	7 600	0	10 400			
South Africa	599 650						
Sudan	39 050	1 600	1 200	38 650	19.5	0.82	0.16
Swaziland	50	0	1 200	1 250			
Tanzania	262 200						
Togo	13 200	100	12 000	25 100	4	0.05	3.5
Tunisia	75 650	5 900	300	70 050	88.5	25.5	0.3
Uganda	212 700	1 300	0	211 400	77.5	0.72	0
Western Sahara							
Zaire	121 700	0	64 500	186 200			
Zambia	66 000	0	3 600	69 600	25.8	0.05	1.12
Zimbabwe	17 200	0	2 500	19 700		0	1.8
TOTAL	3 890 553						

Source: Regional Report, Weber and Durand, UNIDO, 1986.

Annex V
(Helga Josupeit, Fisheries Circular, 755, FAO)

Assistance to fisheries in Africa at 1978 prices (millions of $US) and annual changes (%)

	1978	1979	1980	1981	1982	1983
TECHNICAL ASSISTANCE	16 202	23 784	22 784	25 094	29 494	30 296
Annual variation (%)		+47	-4	+10	+18	+3
CAPITAL ASSISTANCE	35 017	44 302	45 260	60 720	72 795	84 921
Annual variation (%)		+26	+2	+34	+20	+17
Total	51 219	68 086	68 044	85 814	102 289	115 217
Annual variation (%)		+33	-	+26	+19	+13

Subregional distribution of assistance for fisheries
(millions of $US)

North-Central Atlantic (West Africa)

	1978	1979	1980	1981	1982	1983	1984[a/]
TECHNICAL ASSISTANCE	6 441	7 711	8 516	10 016	8 554	10 275	7 770
Multilateral	2 912	3 750	2 741	1 967	1 623	1 505	1 001
EEC	322	322	322	1 822	717	700	600
OPEC	100	100	100	100	0	0	0
Bilateral	3 107	3 539	5 353	6 127	6 214	8 070	6 169
CAPITAL ASSISTANCE	17 888	27 667	29 203	25 035	26 446	25 896	16 095
Multilateral	3 000	4 738	2 500	2 500	1 770	2 770	2 770
EEC	0	1 500	3 100	3 100	2 000	1 200	2 350
OPEC	2 400	2 400	1 799	1 799	1 799	1 900	1 900
Bilateral	12 488	19 029	21 804	17 636	20 877	20 026	9 075
Total	24 329	35 378	37 719	35 050	35 000	36 171	23 865

Source: Regional Report, Weber and Durand, UNIDO, 1986.

a/ Provisional figures.

Annex V (cont.)
Total assistance for different types of fisheries projects
by types of donors (millions of $US)

	1978		1981		1982		1983	
	Multilateral	Bilateral	Multilateral	Bilateral	Multilateral	Bilateral	Multilateral	Bilateral
I. Research	6 318	15 078	17 477	39 792	9 556	31 217	8 578	27 210
Anti-pollution measures	0	82	256	83	39	286	0	286
II. Small-scale fisheries	17 276	3 940	24 257	13 689	38 531	19 065	46 388	19 145
Co-operatives	3 550	12	1 994	118	2 119	215	250	203
Credits	5 071	0	19 448	0	4 390	1 125	4 730	1 125
Motorization	1 989	732	4 175	3 845	6 795	3 113	5 920	1 033
III. Industrial-scale fisheries	15 557	22 073	26 128	12 089	41 712	34 388	48 134	31 478
IV. Ports	12 451	15 747	33 816	28 170	42 346	43 864	47 367	32 505
Ships	2 375	25 437	20 656	40 230	12 212	27 410	10 671	36 346
Careenage yards	0	0	3 000	0	3 000	100	0	100
Shipbuilding	657	6 141	1 427	5 100	41	1 400	36	500
Gear	0	1 218	0	4 493	0	9 003	0	7 806
V. Marketing	307	1 735	910	3 342	1 072	5 356	1 010	4 332
Processing	508	496	4 092	166	1 325	2 602	1 198	5 941
Ice factories	349	7 247	109	9 575	1 249	10 842	1 240	9 840
Nutrition	0	0	222	0	15	0	0	0
VI. Aquaculture	11 891	4 901	38 553	17 725	49 182	22 080	55 765	19 559
VII. Counselling on economic matters and planning	3 854	566	6 055	1 284	6 509	2 401	6 412	2 369
Follow-up and monitoring	0	5 396	190	3 000	290	3 040	250	3 040
Exclusive economic zones	80	0	1 329	0	2 043	3 575	1 100	3 575
Feasibility studies	1 147	104	0	550	606	787	83	530
VIII. Training	3 502	3 516	3 931	12 079	10 656	13 533	14 014	15 107

Source: Regional Report, Weber and Durand, UNIDO, 1986.

ASIA

Principal characteristics of fishery activities in the region as a whole

1. This is the region with the highest level and widest range of fishery activities on the part of developing countries. In the developing countries of Asia these activities range from aquaculture, which is practised in China on a scale exceeded only in Japan, to a highly developed tuna-canning and shrimp-freezing industry. It is also a region which, in addition to having one of the highest per capita fish consumption rates in the world, is an active participant in the international trading in fish products, of which the Asian countries, taken as a whole, are net exporters.

2. At 32 million tons in 1985, the catches of this group of countries account for a very substantial percentage of the world total.

3. For many of these countries, fishery activities are of paramount socio-economic importance, representing as they do a key food source. In South-East Asia, 55 per cent of the animal protein consumed by the population is obtained from fish.

4. Fishery activities in the developing countries of Asia are conducted mainly on a small scale, with the traditional working methods still in use. Most of the labour force is engaged in small-scale operations.

5. Although countries like China, India, Indonesia, Malaysia, Thailand and others have extensive experience in this area, small-scale fishery activities are beset with many problems. These have to do with poor handling practices, inadequate marketing arrangements involving too many intermediate links, excessive losses, fluctuating catch volumes, lack of financing and inadequate infrastructural facilities.

6. The intense activity that has characterized the fisheries sector has led to the first signs of overfishing along a number of the densely populated coastal stretches of Indonesia and China as well as in the inland waters of Thailand.

7. Additional deep-water marine zones are available that could be more extensively worked, as well as a number of potential freshwater resources, including those of the fish-farming (aquaculture) sector.

8. On the basis of these highly exploited resources, exports of tinned and frozen tuna and also of shrimp (mainly frozen) are not only generating substantial revenue for the region, but are also supporting a highly developed industry and ensuring an active presence in world markets.

9. In addition to the traditional products that are consumed in each individual country or within the region as a whole, particular mention should be made of a number of speciality items that are performing successfully in the international market, such as, for example, the sauces or the tinned shrimp that is exported mainly by Thailand to the United States.

10. As in other regions, small-scale fishery activities involving limited production volumes are of great importance. A very wide range of sun-dried fish products, shellfish and crustaceans are commonly found throughout the Asian region, as are certain other typical products hot-salted in brine and fermented.

11. International trading among the various countries of the region is very extensive and is marked by a certain degree of intraregional complementarity.

12. There have been major advances, chiefly in specific countries such as India and China, in the domestic manufacture of fish processing equipment and fishing implements.

Division of the Asian region into three subregions for purposes of description

For the purpose of systematizing and simplifying the overall analysis and in order also to reflect a number of specific characteristics, the region has been divided for descriptive purposes into three zones, under each of which the developing countries with the most highly developed fisheries sectors are examined. For the purposes of this description, the most representative countries were selected for each subgroup.

The criterion underlying this division is based on a number of considerations and takes into account both elements of an economic and political nature as well as factors connected with the nature of the operations and the destination of the products.

The result is the following scheme:

Group 1:	Bangladesh* Burma India* Pakistan Sri Lanka	Countries located in the East with extensive small-scale fishery activities that are, however, less developed than in the rest of the region under consideration.
Group 2:	Indonesia* Philippines Malaysia Thailand* Singapore	Association of South-East Asian Nations (ASEAN), generally characterized by high per capita consumption and more extensive fishery activities, including industrial-scale operations; in addition, taken together, a strong export group.
Group 3:	China* Republic of Korea Hong Kong	The particular feature with respect to China is that country's political and economic system and its highly developed inland fisheries sector.

In addition, within Group 1, Bangladesh (because of its recent development) and India were selected as the most representative countries.

Within Group 2 (the ASEAN countries), Indonesia and Thailand are described in greatest detail.

Within Group 3, only China is discussed in any depth.

Profiles of the selected countries

Group 1

A. Bangladesh 1/

Bangladesh, one of the youngest countries in Asia, has a limited territorial area (141,131 km^2) and is also one of the world's most densely populated countries. The most important national activity is agriculture, with the fisheries sector contributing about 5 per cent of the gross domestic product and more than 9 per cent of the nation's exports. Fish is the most important source of animal

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1/ Information taken from INFOFISH Marketing Digest, No.1, 1986 and other sources.

protein, furnishing 80 per cent of this protein to a population of 96.5 million inhabitants (1984). Considered on a per capita/per annum basis, fish consumption is low in comparison with that of other Asian countries with a traditional preference for fish, being in the order of 8 kg and having declined in recent years despite the great increase in production. The fisheries sector provides a livelihood for 6 per cent of the population, if auxiliary activities are included.

Bangladesh has a 480-km-long seacoast and about 1 million hectares of territorial waters. According to existing estimates, the country's waters could provide annual catches in the order of 275.000 tons of fish and 2,000 to 3,000 tons of shrimp. However, Bangladesh is a country with many rivers and canals. Inland catches account for 80 to 90 per cent of production. The total area of inland waters from which fish and shrimp are taken is in the order of 4.4 million hectares. Both marine and inland fishery activities are based on very rudimentary small-scale methods of operation and involve minimal capital investment.

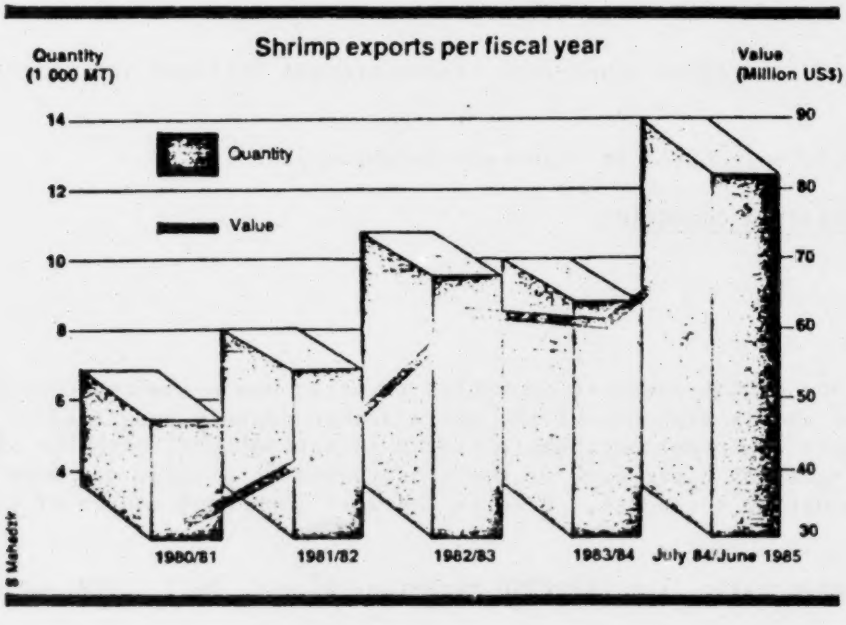
Development of the fisheries

In the light of the growing importance of the country's fishery resources, the Government has adopted measures for the development of this sector and the conservation of the resources.

In this connection, the commercial organization of the public sector, represented by the Bangladesh Fisheries Development Corporation (BFDC), has undertaken a number of specific activities, including assistance to fishermen and merchants for the purpose of achieving efficient marketing. These activities are connected with the marketing and distribution of sea and inland fish with a view to supplying the most important cities, such as Dacca and Chittagong. In addition, national fishery products have been promoted in the Middle East and Europe. Moreover, there are some 50 private organizations with modern facilities that are playing an important role in the current development of the sea fisheries, producing a large number of products for export, such as dried fish, frozen shrimp, frozen fish and others.

Exports

Exports of fishery products began in 1960 and acquired importance in the 1970s. The most important items are prawns and frozen fish, with frogs' legs representing an additional interesting item.



In 1983, Bangladesh accounted for about 1.5 per cent of the world supply of shrimp, the principal markets being Japan, the United States, Europe and other Asian countries. Fishery products are the second-most important category of national exports, and shrimp account for more than 90 per cent of the total. The following diagram indicates the figures for shrimp exports, in thousands of tons and millions of United States dollars, during the period 1980-1985.

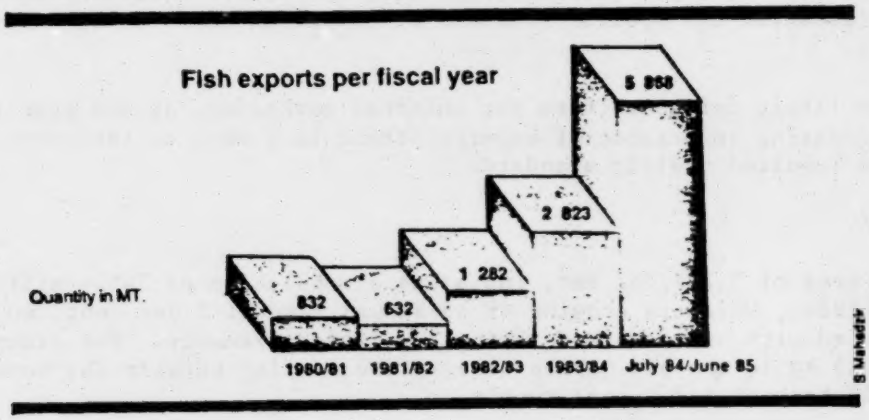
The export of frogs' legs began in 1979-1980 at 300 tons, increasing to 2,500 tons in 1983-1984. In economic terms, these exports accounted for 3.98 million dollars in the period 1984-1985.

Exports of frozen fish include various species, such as grouper, sea bream, porgy, sheat-fish, mackerel and carp. The greater portion of the freshwater fish is exported to Middle Eastern countries and to the United Kingdom. The table below contains consolidated figures for frozen fish exports.

Value of frozen fish exports
(July 1984 - June 1985)

Markets	Million $US
United Kingdom	1.20
Malaysia	1.19
Thailand	1.10
United Arab Emirates	0.69
Saudi Arabia	0.60
Kuwait	0.46
Oman	0.19
Belgium	0.07
Qatar	0.05
Singapore	0.04
Netherlands	0.02
Hong Kong	0.02
Bahrain	0.02
Total	5.65

Exports of dehydrated fish began in 1977-1978, showing excellent potential. The South-East Asian and Middle Eastern countries provide a good market for these products. The dehydrated products are based on various species, such as jewfish and pomfret, shrimp, and shark fins and tails. Crabs and lobsters are also exported.



Industrial-scale processing

Most of the country's export products originate at on-shore plants, mainly at Chittagong, Khulna and Coxis Bazar. Fish is also processed directly on the trawlers, but not in large quantities. There are some 50 industrial-scale enterprises engaged in the processing, and they are currently facing a number of problems as a result of:

- Inadequate raw material supplies;
- Insufficient number of vessels with refrigeration facilities and containers;
- High chartering costs;
- Inadequate storage facilities at the ports; and
- Inadequate credit facilities.

One interesting possibility would be the exploitation of the "pilot fish" found accompanying shrimp for the production of minced meats and pastes.

Small-scale preservation

The most typical method for the small-scale preservation of fish and even shrimp, in the case of both marine and inland-water resources, is sun-drying.

In general, the problems encountered in handling are common to all small-scale operations, namely, the lack of an unloading infrastructure, too many intermediate links, poor distribution and sales arrangements, generally deficient sanitation conditions, and others.

Specifically, the area of greatest attention is sun-drying. The fish, whether small or large in size, are normally dried without previous salting. The time required for complete drying is five to six days for small fish and more than a week for the larger varieties. "Hilsa ilisha", which accounts for a substantial portion of the total catch, is the only fish species preserved by means of wet or dry salting. The result of these customs is that the fish are not adequately preserved. Efforts are being made, using simple methods, to speed up the sun-drying process. These involve the introduction of polyethylene tents. The small shrimp are smoked and dried.

Very large quantities of products consumed in the country are produced by the sun-drying methods, but losses are high as a result of fly-larvae infestation and other factors. What is more, as a general rule proper packaging is not used for internal distribution, the customary bamboo baskets failing to ensure sufficient protection. During the wet season, the ambient humidity rises to 85 per cent, so that the dried fish reabsorb this moisture with the result that they become subject to fungal infestation and spoil. Problems of oxidation can also be observed in fish products.

There is little infrastructure for internal marketing, at the same time that, given the increasing importance of exports, there is a need to introduce and guarantee the required quality standards.

B. India 1/

With an area of 3,287,782 km^2, India has a population of 746.4 million inhabitants (1984), which is growing at an annual rate of 2 per cent, so that the country is faced with enormous and rising supply requirements. For example, an increase of 0.5 kg in the per capita consumption of fish entails the need for nearly 400,000 tons of additional supply.

India has a seacoast of some 7,517 km, a continental shelf of 452,000 km^2 and an exclusive economic zone of 2.02 million km^2.

1/ Information taken from the INFOFISH/UNIDO Report, November 1986.

The marine resources can be divided into three strata: those found at a depth of 0 to 50 metres (near the coast), which have been estimated at 2.3 million tons and are currently being exploited in the amount of 1.3 million tons; those found between 50 and 200 metres, estimated at 1.5 million tons and subject to limited exploitation; and the deep-water resources, at depths below 200 metres, which have been estimated at 700,000 tons and are currently underworked, accounting for less than 1 per cent of the total catch. The potential estimated total is about 4.5 million tons, with current exploitation at 40 per cent. Among the species so far underexploited are the sheat-fish, cephalopods and tuna. Recent studies have also indicated the existence of promising concentrations of shrimp and lobsters at depths of about 100 metres. The western coast contributes 65 per cent of the total catch, the most heavily fished species being the sardine, the Bombay duck and the shrimp of the Peneidae family.

The inland waters are also heavily exploited. The 750,000 hectares of pools and lagoons, the 4.5 million hectares of bodies of water and the approximately 75,000 km of rivers and channels annually produce around 1 million tons, the principal resource being cod (catla, rohu and mrigal), which is in great demand in the internal market.

In 1984, marine catches totalled 1,809,067 tons and inland-water production 1,031,108 tons for a grand total of 2,840,175 tons.

Employment

The Indian fisheries sector work-force in 1979 totalled 1,786,600 persons, of whom about 25 per cent were full-time fishermen and another 25 per cent were engaged in part-time fishing, about 5 per cent in processing, about 20 per cent in marketing and the rest in related activities.

Resource utilization

Total catches increased by 33 per cent during the period from 1980 to 1984, with 49 per cent of this increase occurring in the marine fishing sector and 16 per cent in the inland fishing and aquaculture sectors. The most commercially interesting resource - shrimp - was also the production leader in 1984 with a volume of 210,000 tons, accounting for 86 per cent of that year's exports and 85 per cent of the following year's.

The domestic market

Because of its large population, India represents a major market for fishery products despite its low per capita consumption. Virtually all the fish caught are consumed internally, with the shrimp earmarked for export.

Since efficient marketing channels are lacking and the peoples of the interior are not accustomed to sea fish, 95 per cent of this fish is consumed along the coast, where 50 per cent of the population is located. The urban areas, with 23 per cent of the population, consume 40 per cent of the marine products, the largest market being Calcutta. The marketing chains involve a large number of middlemen, with six stages of intermediation in the case of fresh fish and seven for dried fish. Depending on the form of marketing, the fishermen may receive from 98.5 per cent to as little as 21.9 per cent of the amount paid by the consumer. The growth in prices, which has been greater than in the case of other products, is an indication of the heavy existing demand.

Of the total production of shrimp, only those not of the Peneidae family - about 10 per cent of the total - are consumed in the internal market. The entire marketing process is mainly in private hands.

The facilities for handling, preservation and distribution are still very limited.

Exports

As already indicated, frozen shrimp accounts for 85 per cent of the exports, but there is something of a trend towards diversification. For example, frozen and individually dehydrated shrimp represents a new and interesting item.

The other most important products are: frozen lobster tails, frozen cephalopods, frozen fish, dried fish, frozen frogs' legs, shark fins and others. The corresponding figures for these products can be seen in the following table.

Pattern of marine product exports from India, fiscal year 1981-1982 to 1985-1986 (in tons and thousands of rupees)

		1981-82	1982-83	1983-84	1984-85	1985-86
Frozen shrimp	Quantity:	52 180	55 002	54 444	55 398	50 349
	Value:	2 479 458	3 161 517	3 148 081	3 296 954	3 298 187
Frozen frogs' legs	Quantity:	4 065	1 896	2 428	2 728	1 746
	Value:	112 007	47 192	66 836	77 749	74 273
Frozen lobster tails	Quantity:	694	749	648	1 082	1 650
	Value:	51 468	68 551	51 508	78 910	144 528
Frozen cuttlefish/ fillets	Quantity:	1 819	2 305	1 526	1 966	5 010
	Value:	41 244	62 683	33 797	50 950	108 045
Frozen squid	Quantity:	1 387	1 222	2 050	1 663	4 619
	Value:	17 437	20 079	26 911	30 020	55 193
Fresh/frozen fish	Quantity:	6 760	12 847	22 573	9 091	10 561
	Value:	96 193	188 669	290 986	143 980	171 498
Canned shrimp	Quantity:	82	65	41	29	12
	Value:	4 168	4 354	2 406	2 049	605
Dried fish	Quantity:	1 022	2 597	6 492	11 828	8 151
	Value:	7 371	20 978	53 525	99 966	76 139
Dried shrimp	Quantity:	55	90	28	80	73
	Value:	800	731	465	1 075	548
Shark fins and fish maws	Quantity:	358	156	250	249	231
	Value:	37 308	19 936	32 714	33 892	31 200
Frozen clams	Quantity:	-	510	654	1 033	392
	Value:	-	9 736	8 325	14 871	6 237
Fish-oil	Quantity:	402	248	302	469	161
	Value:	1 630	1 020	2 108	3 925	1 618
Beche-de-mer	Quantity:	56	28	79	12	11
	Value:	2 793	1 896	4 104	1 154	1 219
Canned crabmeat	Quantity:	32	57	36	1	-
	Value:	1 909	3 300	1 759	24	-
Cuttlefish bones	Quantity:	34	14	21	12	7
	Value:	548	279	229	183	87
Others	Quantity:	1 159	389	1 119	564	678
	Value:	5 720	2 692	6 450	7 195	10 621
Total	Quantity:	70 105	78 175	92 691	86 205	83 651
	Value:	2 860 054	3 613 613	3 730 204	3 842 897	3 979 998

Source: Marine Products Export Development Authority (MPEDA), Cochin.

Handling

The small traditional fishing boats and even the smaller mechanized vessels do not carry ice for the preservation of their catches. After they have been unloaded, the fish and shrimp are classified and, in the event they are intended for export, are bought up in bulk by the industrial purchasing agents and stored in ice until there is a sufficient quantity to justify transport to the factories.

The boats, which spend from three to six days away from port fishing, are equipped with insulated cargo areas of from 5 to 12 tons' capacity. The larger vessels, generally shrimp trawlers, are equipped with freezing systems and refrigeration chambers. On-board and on-shore handling has recently been improved through the introduction of ice and insulated cases by the Marine Products Export Development Authority (MPEDA), which is engaged in an effort to promote the wider use of ice and improve the fish collection centres. Very often the rudimentary shrimp-peeling facilities are provided by the middlemen, especially in the South. The product is delivered to the canneries, which freeze and export it. The peeling installations are generally of poor quality and require improvement.

The majority of the fish collection centres are in need of a water supply and their own cold-storage areas, in addition to which they also require better hygienic conditions. Not one of the wholesale markets has its own storage facilities.

Very often transport to the canning factories is by means of open lorries. The handling procedures are particularly inadequate in the case of fish intended for the local market.

Processing

There are three processing sectors: for drying, freezing and canning. Until 1950, the bulk of the catches was treated by curing, when it was processed at all; in general, the fish was consumed in the fresh state. With the introduction of processing and cold-storage facilities, there was a dramatic change in this situation.

Curing. In domestic terms, this is the most popular preservation method, even in remote areas. Curing involves the use of traditional methods, principal among which are the following:

(a) Sun-drying without salting;

(b) Dry salting followed occasionally by sun-drying;

(c) Heavy wet salting, without subsequent drying;

(d) Ceylon-type pickling: wet salting with salt and tamarind.

Curing is performed individually by the fisherman in one of the aforementioned forms. The fish is opened and gutted in advance and may occasionally be scaled. So-called Ceylon-type pickling is used primarily with mackerel intended for export to Sri Lanka.

Shrimp too is cured in three ways:

(a) Whole sun-dried;

(b) Cooked, dried and peeled;

(c) Fast-dried under the effect of hot air and smoke.

Freezing. Shrimp, lobsters, frogs' legs, cephalopods and certain fish varieties are frozen. Of the country's total freezing capacity, 36 per cent is located in Kerala State and 20 per cent in Maharashtra State. This activity began as a governmental initiative, but as the international demand for shrimp grew, private investors began building ice factories and facilities for freezing and storage.

Distribution of refrigeration facilities in India by State, 1980

State	Freezing		Ice-making		Cold storage	
	No.	Capacity (tons/day	No.	Capacity (tons/day)	No.	Capacity (tons/day)
Kerala	117	533.80	56	643.75	141	11 547.85
Karnataka	29	12.84	15	212.00	31	2 612.00
Tamil Nadu	46	180.44	36	334.50	60	5 423.50
Andhra Pradesh	21	85.50	23	254.00	25	2 096.00
Pondicherry	-	-	-	-	1	5.00
Lakshadweep	-	-	-	-	-	-
Maharashtra	41	288.30	5	218.00	46	7 336.00
Gujarat	11	92.00	9	96.50	23	3 283.00
Goa	12	45.00	2	19.00	9	560.00
Orissa	14	52.00	5	48.00	15	1 150.00
West Bengal	31	96.25	5	90.00	27	1 929.00
Total	322	1 486.13	156	1 915.75	378	35 942.35

Source: MPEDA, Cochin.

Because of the requirements of the North American market, the processors were forced to undertake great efforts to improve the conditions of sanitation at their installations. The refrigeration chambers are usually small, of less than 50 tons' capacity. The Government is the largest builder of these facilities. In general, the enterprises are extremely conservative in their investment policy, but a number of them have introduced a certain degree of mechanization.

Canning. There is a substantial infrastructure based on the canning of shrimp and currently comprising 64 canneries with a total production capacity of 238 tons/day. Shrimp is the principal canning product, followed by sardines, mackerel, tuna, crabs and other species.

The major difficulty in the canning sector has to do with the supply of good-quality packaging. The traditional tin can is still in use, although it is difficult to open and, in addition, with it the cost of packaging accounts for 33 per cent of the total. Canning is in fact an alternative activity under conditions of surplus or low-priced fresh or frozen fish. In addition to the high cost, quality considerations limit the possibility for a greater penetration of the export market.

Fish meal. There are few plants and none of them are operating at capacity for lack of raw material. Initially, these plants used discarded fish, but prices have increased to such an extent that this is no longer feasible.

Distribution of canneries and fish-meal plants and their capacity

State	Canning		Fish-meal	
	No.	Capacity (tons/day)	No.	Capacity (tons/day)
Kerala	42	156.49	3	62.50
Karnataka	9	38.00	5	150.00
Tamil Nadu	3	4.50	6	62.00
Andhra Pradesh	1	0.05	-	-
Pondicherry	-	3.00	-	-
Lakshadweep	1	3.00	-	-
Maharashtra	3	5.50	6	95.00
Gujarat	1	6.40	12	194.00
Goa	7	33.50	1	12.00
Orissa	1	1.00	-	-
West Bengal	-	-	1	14.00
Total	68	251.44	34	589.50

Source: MPEDA, Cochin.

Chitin. The squilla shrimp, which has a high chitin content, and also shrimp heads are used for the extraction of this industrially useful material.

Others. Other preparations are also produced in India, although not on a large scale, as, for example, fish pastes, powders and sauces. Likewise of some importance are shark fins and tails, maws, fish oil, shark liver oil, turtle meat, etc.

Process mechanization

The use of machinery for the processing of fish is still in its infancy; for example, washing at the various stages is performed manually. Similarly, as a general rule, machinery is not yet in use for the classification, peeling, cutting and removal of the heads of such fish as sardines and mackerel.

A machine for separating the muscle and bone of fish has been developed that might be useful in developing new minced-type products.

Most of the equipment is imported and subject to heavy duties, although there are preferential rates for a number of machines. In general, a level of technological development adequate to India's fisheries production potential has not been achieved.

Product development

There are many possibilities in this area that depend on advances being made in the use of appropriate technology.

(a) Whole shrimp: requires optimum handling to guarantee highest quality;

(b) Rapid freezing-dehydrating of shrimp: this product has been developed to some extent at a single plant;

(c) Squid: the freezing and drying of squid is being developed;

(d) Shark fins;

(e) More effective use of underutilized resources;

(f) Fish gel: under production for export to Japan.

Quality control

The country has an extensive official control system, legally based on provisions dating back to 1963. The control function is the responsibility of the Ministry of Commerce, the Indian Standards Institution, the Marine Products Export Development Authority (MPEDA) and the Central Institute of Fisheries Technology (CIFT).

All fisheries export products are subject to mandatory inspection. The Central Inspection Agency emphasizes plant control, requiring that production facilities comply with certain minimum conditions set forth in an official "Code of Practices".

Since 1981, industrial enterprises may opt for operating their own quality control system, using their own analysis laboratories. By the end of 1983, 30 plants had availed themselves of this possibility.

Research and training institutions

- Central Marine Fisheries Research Institute (COCHIM).

  Carries out biological and technical research and is responsible for gathering statistical information.

- Central Inland Fisheries Research Institute.

- Central Institute of Fisheries Education.

  Carries out training and extension projects that cover nautical sciences, engineering, fisheries exploration, oceanography and other subjects.

The fisheries administration

The fisheries sector in India has, under the Ministry of Agriculture, specific governmental agencies that are responsible for the formulation of national regulations, development programmes, fishing ports, processing and canning, education and training, marketing, fisheries research, etc.

There is a co-operative system with a three-tiered administrative structure involving the co-operative itself, a regional body and a national federation. The system operates as an agency designed to provide credits, supplies, assistance and supervision.

Development problems and constraints

The fisheries offer the country an important development potential. The main limitations on this potential may be identified as the following:

- Little use of industrial technology;

- Lack of facilities at the unloading ports for small-scale fishing;

- A low level of investment by the private sector in the handling and processing infrastructure;
- Lack of drinkable water and ice and poor hygienic conditions at the unloading points, collection centres and throughout the internal distribution system;
- High post-capture losses;
- Inadequate means of transport;
- High prices for imported goods;
- Use of inadequate packaging and containers;
- Lack of training for the technical operators and commercial agents;
- Need to improve the socio-economic conditions of the fishermen.

Group 2

A. Indonesia

The country of Indonesia consists of some 13,000 islands with a total coastline of 36,600 km and territorial area of about 2 million km^2. Its territorial waters extend over 3.1 million km^2 and its exclusive economic zone over 2.7 million km^2. The submarine shelf, down to a depth of 200 metres, represents an area of some 775,000 km^2. Indonesia declared its EEZ in 1980.

In 1984 the population totalled 162.2 million inhabitants, with an annual growth rate of 2.1 per cent. Two-thirds of this population is concentrated on a few islands, such as Java, Bali, Madura and Lombok.

The most extensive fishery activities, basically of the small-scale kind, are concentrated in the most heavily populated centres. The small-scale fisheries account for 38 per cent of fisheries production and 99.8 per cent of employment among those actually engaged in fishing. While the industrial-scale sector is expanding, it still relies on only a limited number of products, such as shrimp and tuna. All told, the fisheries sector is the country's largest source of employment, providing jobs for 3 million persons. Despite this fact, in 1983 it contributed only 1.66 per cent to the gross national product, which is an indication of its low productivity, due in turn to the small-scale methods of operation in use.

Resources

The available figures are not sufficiently reliable to permit an accurate quantification of the existing resources, but a general description would be one that is typical of most countries surrounded by tropical waters, i.e., a large number of species but no great concentrations, with the exception, in the case of Indonesia, of the small sardines found near Bali. Some 200 species have been identified, but only 65 appear in the catch statistics. In general, the resources have not yet been heavily exploited, especially in the waters furthest away from the coast, which are beyond the reach of the small-scale fishermen.

Potential and exploitation of fishery resources in Indonesia, 1983
(in thousands of tons)

Fishery type	MSY/annum	Production	Rate of exploitation (%)
Marine fisheries	6 625	1,682	25.4
- Archipelagic water	4 510	NA	NA
- Exclusive economic zone	2 110	NA	NA
Inland fisheries	1 400	532	38.0
- Aquaculture	700	267	37.9
- Open-water	700	265	38.1
Total	8 025	2 214	27.6

Source: Marine Fisheries Development Programme for Ten Years, Directorate General of Fisheries, Indonesia.

The above table shows the 1983 figures for resources and exploitation. In 1984 there was a slight increase in catch volume, to 2,252,989 tons. In particular, in 1982 the exploitation rate for tuna was 22.85 per cent and for shrimp 68.99 per cent.

As far as inland waters are concerned, Indonesia has about 13.7 million hectares of open waters and 265,000 hectares devoted to aquaculture, the currently exploitable resources being estimated at 1.6 million tons annually.

Among the most heavily fished marine resources are the tuna and the small pelagic varieties, such as the mackerel, the small sardine and the anchovy. Also included are the "tiger", "banana" and other shrimp varieties as well as shellfish.

Shrimp production, 1983-1985
(in tons)

	1983	1984	1985
Marine fisheries	111 384	103 360	108 630
Inland open-water fisheries	6 924	7 337	-
Culture (brackish water)	27 754	32 093	36 450
Total	146 062	142 790	145 080

In the industrial-scale marine fisheries sector, most of the joint ventures established between Indonesia and Japan are engaged in catching tuna and shrimp.

With respect to inland-water fishing, and specifically fish-farming, the largest figures are accounted for by carp, tilapia, sheat-fish and other species.

As far as production in brackish waters is concerned, the principal items are milkfish and Mozambican tilapia, various shrimp species and crabs.

Employment

In total, some 6 million persons are engaged in fisheries activities. In 1984 around 3 million were employed directly, representing five per cent of the national work-force. Of these 3 million, nearly half are involved in marine fishing, about 15 per cent in inland open-water fishing, and about 40 per cent in aquaculture. Of those engaged in aquaculture, 75 per cent work in fresh water and the rest in brackish waters. The number is continuing to increase, and in certain of the more easily accessible locations evidence of overfishing is beginning to appear. The role of women and children varies from region to region; their activities consist primarily in gathering marine organisms from the shallow waters along the coast and in processing them. The percentage of women in the entire range of fisheries activities is between 7.5 and 10 per cent.

Disposition of the catches

With the exception of the frozen shrimp, the frozen and canned tuna and certain other selected products, the great bulk of what is caught is consumed locally. The highest consumption levels are found in Java and Bali. About 62 per cent of the local supply of animal protein is derived from fish. The per capita consumption varies from one area to another; in Java it totals 6.3 kg/year; in Irian Jaya, 27.9 kg/year; and in Kalimantan, 41.4 kg/year. The national average is only 13.5 kg, but the Government's objective is to achieve a figure of 22.5 kg/year.

Disposition of marine and inland capture fisheries landings, 1980
(in tons: whole-fish equivalent)

	Marine fish	Inland fish	Total	% of total
Fresh fish	657 329	167 707	825 036	50.0
Dried/salted fish	516 142	76 264	592 406	35.9
Boiled fish	83 058	997	84 055	5.1
Femented fish	37 426	883	38 309	2.3
Smoked fish	30 802	6 142	36 944	2.2
Other processed fish	9 946	1 701	11 647	0.7
Freezing	47 408	804	48 212	2.9
Canning	9 196	-	9 196	0.6
Fish meal	3 503	-	3 503	0.2
Total	1 394 810	254 498	1 649 308	100.0

Source: Directorate General of Fisheries, Indonesia.

Note: No data are available on the disposition of aquaculture production.

The external market

The relative importance of fishery product exports has increased in recent years ahead of that of petroleum and gas. Nevertheless, in 1984 only 3.3 per cent of fisheries production was earmarked for export. In 1983, marine products accounted for 96 per cent of these exports.

Ton amounts and value in $US of fishery product exports

	1982		1983		1984		1985	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Shrimp	25 576	181 640	26 166	194 447	28 025	195 552	30 980	202 710
Tuna/skipjack	18 788	19 863	20 311	14 776	14 702	10 674	17 890	13 770
Other marine fishes	26 336	9 975	NA	NA	8 429	3 919	9 100	4 610
Frogs' legs	1 517	3 585	3 296	8 753	2 200	4 122	2 800	6 570
Jellyfish	2 238	4 457	4 108	8 181	2 556	4 672	1 875	2 720
Shrimp crackers	2 647	5 010	-	-	-	-	-	-
Ornamental fish	217	98	196	166	204	190	235	470
Others	12 310	24 788	NA	NA	19 579	28 954	21 924	28 600
Total	89 629	249 416	NA	NA	75 695	248 063	84 490	259 450

Source: Fisheries Statistics of Indonesia, 1982.

With respect to imports, there was rapid growth until 1982, but this was followed by a drastic decline in meal imports by some 75 per cent from 1982 to 1985, which produced a total value of $US 22.9 million in 1985.

Volume and value of fishery product imports, 1978-1982 (in tons and $US 1,000 cif)

	1978		1979		1980		1981		1982	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Fish meal	18 948	2 247	27 957	3 338	34 195	15 997	53 033	33 626	72 008	38 993
Canned fish	7 528	6 662	2 556	2 105	1 763	2 438	1 120	1 283	1 781	2 646
Agar-agar	96	557	62	393	159	848	43	301	262	542
Fish oils	307	247	248	276	195	327	287	312	324	364
Fresh/frozen fish	31	72	44	107	2 853	666	7 437	1 826	7 670	2 098
Others	189	244	151	497	353	695	1 300	1 127	1 285	901
Total	27 099	10 029	31 018	6 716	39 517	20 971	63 220	38 475	83 410	45 544

The domestic market

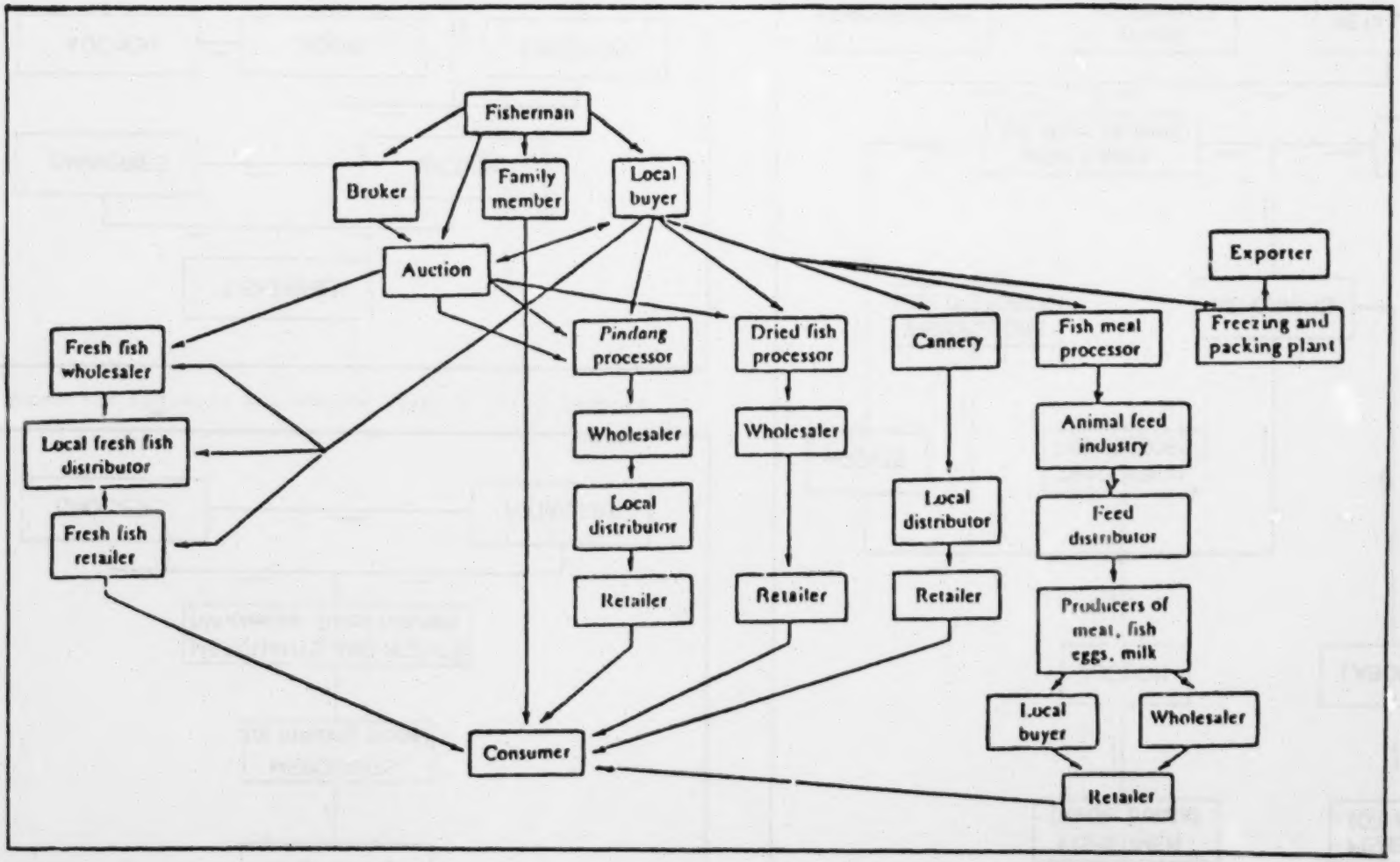
Distribution in the internal market is almost totally in private hands. Large volumes of products are brought in from other islands to the major consumption centres.

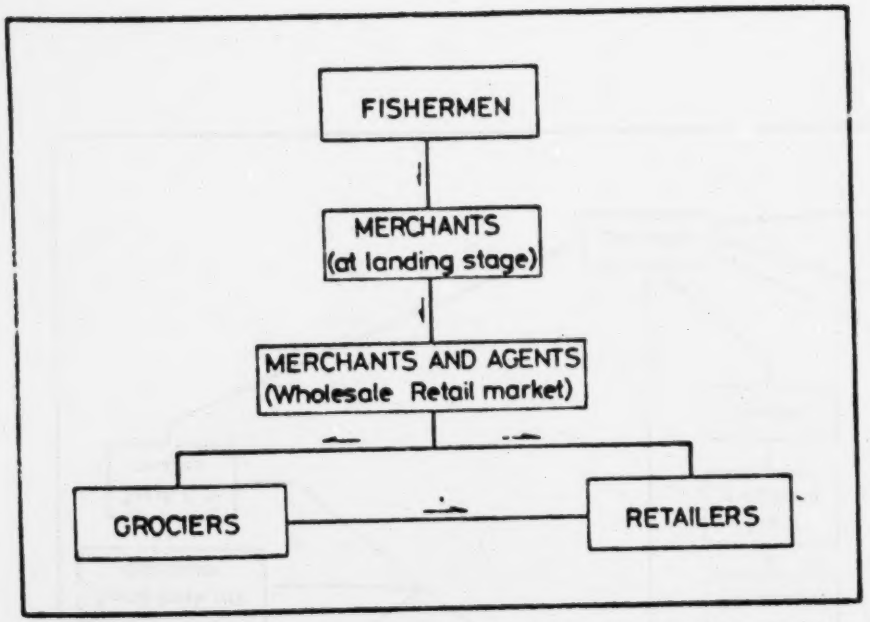
Marketing may be directly to the consumer or through merchants and middlemen. In Java, the fisherman is often obliged to turn over his hauls to a middleman to whom he is financially linked.

The distribution chain for fresh fish involves a large number of transactions before the product reaches the final consumer. The dried fish chain is more direct, running from the provincial commercial agents to the urban wholesalers and retailers.

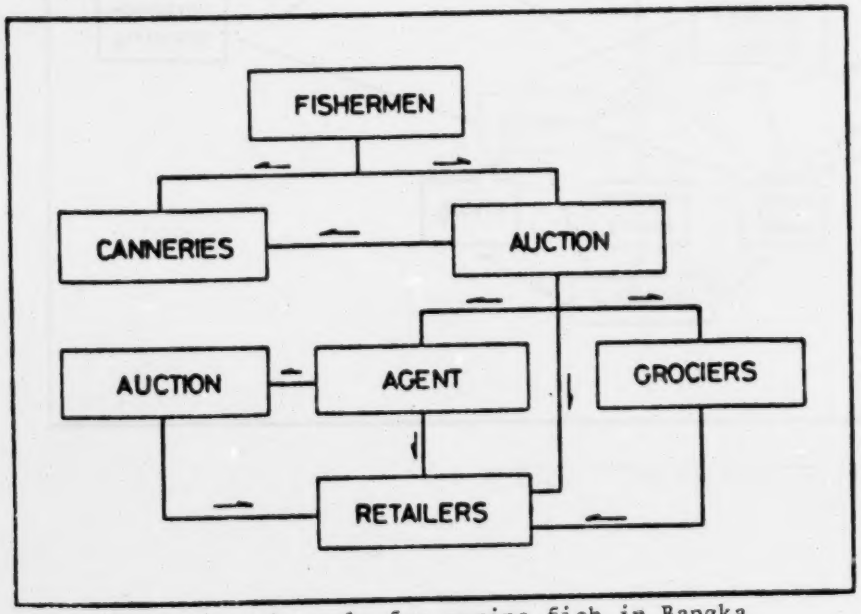
The structure of internal marketing is illustrated in figure 1.

Figure 1. Structure of fish marketing and distribution

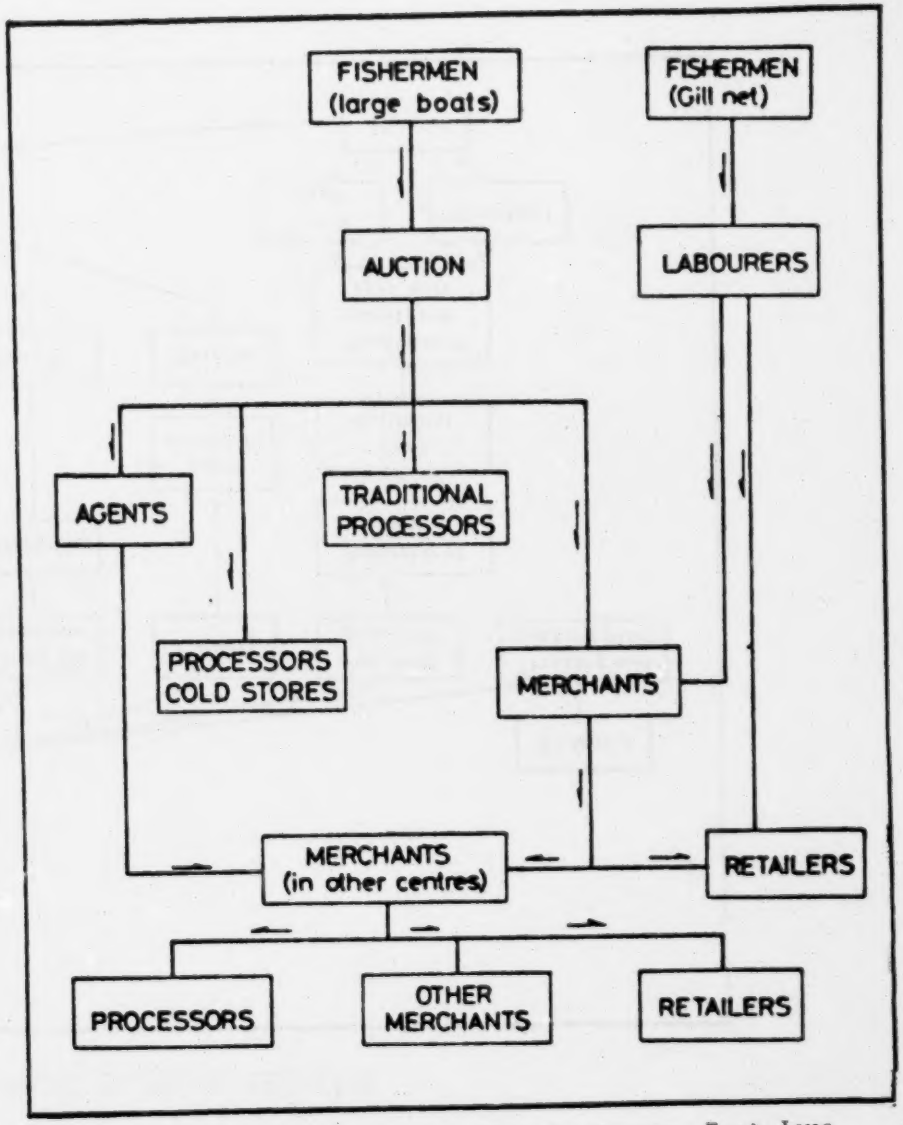




Marketing channels for marine fish in North Sumatra



Marketing channels for marine fish in Bangka



Marketing channels for marine fish in Muncar, East Java

Handling

Nearly 98 per cent of the catches are taken by small-scale fishermen working from vessels of limited size. The methods are extremely rudimentary and no ice is used.

The hamlet environment in which fisheries activities are conducted along the coastline of the islands makes it very difficult to provide adequate facilities ensuring the availability of water, enclosed hygienic premises or ice for the handling and marketing stages. As a result, the finished products are of poor quality. In 20 per cent of the high-value raw material, such as shrimp, there are signs of spoilage by the time it reaches the processing plants.

As a general rule, once it has been unloaded, the fish is placed in bamboo or rattan baskets (plastic receptacles have more recently been introduced at a number of pilot project sites.) The fish is then repacked with ice if it is intended for delivery to distant processing plants or markets. Fish is accepted without ice in the rural zones. Lorries and vans are used for transport; for inter-city hauling, insulated crates are coming into use. Between 20 and 30 per cent of the fish unloaded or caught in remote areas is lost because of the lack of ice. In response to this problem, the Government is endeavouring to increase ice production and encourage the wider use of insulated crates.

With the exception of the specially cultivated fish (which are carefully handled), the deficiencies in the treatment of the freshwater species are greater than in that of the marine varieties.

Processing

Processing for the internal market is mainly on a small scale. In 1980 some 8,000 traditional installations were operating in the country; these facilities processed 763,000 tons of fish. More than 50 per cent of the persons active in this sector are engaged in the processing of dried and salted fish.

Because of their popularity, low price and the ease with which they can be stored and transported, the most important items in the local markets are the dried, salted, brine-boiled and fermented fish products.

The inadequate handling, the primitive technology employed, the deficient hygienic conditions and the hot climate are responsible for the fish's rapid deterioration. The quality of the salt is also sometimes poor.

Canning is restricted almost exclusively to pelagic fish varieties, especially sardines. For this reason, the canneries are found mainly in the Bali area.

Fish meal is produced together with the tinned fish. At present, new canneries are being built for the large-scale exploitation of tuna.

Quality control

A quality-control programme has been established for both export products and the internal market. The fisheries authority and the Ministry of Public Health are involved in this system. The standards provide for minimum requirements with which the processing plants are expected to comply. Throughout the country, 24 quality-control laboratories have been built, and the export products, which require an "export certificate of quality", must meet the established standards. The main effort is focused on frozen shrimp, frogs' legs and tuna, for which organoleptic and microbiological analyses are carried out.

The Government is also committed to improving the port infrastructure and the handling facilities with a view to ensuring better quality.

Infrastructure for industrial-scale processing

Freezing plants, ice factories and cold-storage depots:

The most commonly used refrigeration systems are of the cold-air and contact-plate type. In 1980 Indonesia had 38 freezing units with a daily freezing capacity of 284 tons. The majority of installations are used for the freezing of shrimp as an export product.

In 1980 there were in the country 635 ice factories with a total capacity of 7,000 tons/day, most of them located in the large cities.

There are 69 cold-storage chambers with a capacity of 145,000 tons. In general, these are privately operated and used for shrimp and tuna.

Canneries

Indonesia has 18 canneries with a daily capacity of some 198.5 tons. In 1982 some 9,844 tons of fish were processed in these canneries. The expansion of this industry is limited by the lack of cans. It is hoped that it will be possible to solve this problem through the erection of a State-run factory to produce cans at a volume of 130,000 tons a year.

There are also problems in connection with the supply of raw materials, since the preferred policy is to export the tuna in frozen form.

Institutional arrangements

Fishery activities in Indonesia are regulated by specific agencies of the Ministry of Agriculture, which, in addition to its regulatory responsibilities, is charged with the compilation of statistics, the issues of fisheries licences, training, monitoring and the supervision of the fishermen's organizations.

Operating as a field agency is the Directorate General of Fisheries, which administers the development centres and the fishing ports. So-called "provincial services" are active in the provinces.

An important role in the organization of fisheries activities is assigned to the co-operatives.

The official institutional structure includes research and development centres and also a Fisheries Academy with four faculties.

In addition, training is provided through educational departments and institutes subordinate to the provincial governments.

There are also systems designed to provide support in the form of credits to the various associations and co-operatives of small-scale fishermen. These systems operate in a number of ways, both directly and indirectly.

Principal problems

- To increase the internal supply in a manner adequate to the growth of the population;

- To raise productivity;

- To upgrade product quality and reduce losses;
- To make possible better handling conditions by building additional facilities;
- To improve the transport and internal distribution infrastructure;
- To develop additional export products;
- To provide better packaging and storage conditions for the traditional fishery products.

B. Thailand

Thailand recorded a population of 15.7 million inhabitants in 1984. This is a nation with a traditional fisheries sector, 90 per cent of the fish take coming from marine catches. With its annual production volume of 2.2 million tons, the Thai fisheries sector ranks fifth in Asia behind Japan, China, India and the Republic of Korea. During the period 1960 to 1977, the industry grew at an annual rate of 15 per cent.

Although there has been a decline in the volumes unloaded in recent years, exports continue at a very high level.

Resources

Marine resources

Thailand has a sea coastline of 2,600 km. The potential total of recoverable marine resources is in the neighbourhood of 1.4 million tons. The Gulf of Thailand is estimated to have resources of 910,000 tons, of which 770,000 are demersal and 140,000 are pelagic. In the remaining area of the Sea of Andaman there are 200,000 tons of demersal resources and 90,000 of pelagic.

Some 850 marine species are known to exist, among which the most important are: mackerel, sardines, anchovies, tuna, sea bream, grouper, croaker, shrimp, lobster, squid and others.

Inland water resources

Taken together, the country's principal rivers have a combined length of some 20,000 km, yielding 18,000 km^2 of reservoirs suitable for aquaculture. The total lake area is about 30,000 hectares.

There exist in Thailand some 560 freshwater species, the most important being carp, gourami, sheat-fish, tilapia and shrimp.

Resource exploitation

The total production of aquatic resources increased in Thailand from 213,000 tons in 1960 to 2.2 million tons in 1977. The unloaded volume of marine species subsequently declined until 1980, recovering thereafter. That decline was in response to the movement in petroleum prices, the declaration of an exclusive economic zone by neighbouring countries and, possibly, to some overfishing in the Gulf of Thailand. The recovery has coincided with the reorganization of the international licensing system and the increase in fish culture production.

The figures for recent years can be seen in the following table.

Fisheries production by subsector, 1974-1983 (in tons)

Year	Total	Marine capture fisheries	Mari-culture a/	Inland capture fisheries	Brackish-water ponds b/	Inland aquaculture			
						Ponds	Freshwater cages	Ditches	Paddy
1974	1 510 466	1 315 926	33 889	158 876 c/	1 775	NA	NA	NA	NA
1975	1 555 300	1 303 816	88 254	130 856	2 538	14 770	227	214	14 625
1976	1 699 086	1 389 282	159 987	114 936	2 523	13 292	201	291	18 574
1977	2 189 907	1 934 266	130 101	89 233	3 166	16 051	477	279	16 334
1978	2 099 281	1 849 769	98 101	102 129	9 915	17 695	111	243	21 318
1979	1 946 334	1 812 585	89 914	103 714	10 659	15 653	334	273	13 202
1980	1 792 948	1 581 677	54 458	110 490	11 818	18 394	403	371	15 337
1981	1 989 025	1 723 774	87 091	116 558	13 579	28 568	1 005	1 218	17 232
1982	2 120 133	1 860 994	112 735	87 732	12 842	26 527	324	642	18 337
1983	2 255 415	2 002 076	83 828	102 820	14 064	----------	52 627	----------	

Source: Department of Fisheries, Thailand.

a/ Mariculture production comprises cultured cockle, green mussel, oysters and horse mussel.

b/ Brackish-water pond production includes all shrimp species plus crab and fish. However, for the period 1974-1976 only the shrimp species are included.

c/ Includes fresh-water aquaculture.

Exploitation of inland waters

In 1983 the inland fisheries contributed 5 per cent to the total national fisheries production volume. Although, so considered, this may not seem to be an important activity, it provides a livelihood for 13,500 families.

The most important species that year were the tilapia with 25 per cent of the catches, the "sepat siam" with 19 per cent, the sheat-fish with 15 per cent, the carp with 10.6 per cent, and the snakehead with 10.6 per cent. For its part, aquaculture contributes 8 per cent of production and is practiced in both fresh and brackish waters. Mariculture has expanded at a more rapid rate than the other fisheries sectors.

Marine exploitation

Marine exploitation is intensive, and many of the resources that represent the basis of this area of fishery activity appear to have entered a phase of overfishing, since the increased efforts that have been made to recover these species have not led to any rise in production statistics. In 1984, 65 per cent of the catches were of commercially valuable species.

Marine fishing may be divided into industrial-scale and small-scale fishing. In the industrial-scale sector, the majority of the vessels are trawlers and purse seiners. For small-scale fishing, such equipment as bamboo traps and small manually operated nets are used. In this case, the small-scale fisheries produce only some 500 tons a year. The trawlers account for 50 per cent of the total catches, the purse seiners for 24.5 per cent, the trawlers operating in tandem for 11 per cent and the purse seiners in tandem for 4 per cent.

Use of the catches

The figures show that, with the exception of dried and salted fish, use increased in 1984 in all areas of activity. The overall increase totalled 20 per cent, but growth was particularly spectacular in the canneries sector, where the figure of 4,241 tons in 1980 rose to 181,326 tons in 1984.

In 1984, 42.8 per cent of the marine resources were used for fish meal, 22.4 per cent were consumed fresh, 10.2 per cent were frozen, 9.2 per cent were canned and 4.9 per cent were salted and dried. The rest was cooked, smoked or used for the production of shrimp paste or in other ways.

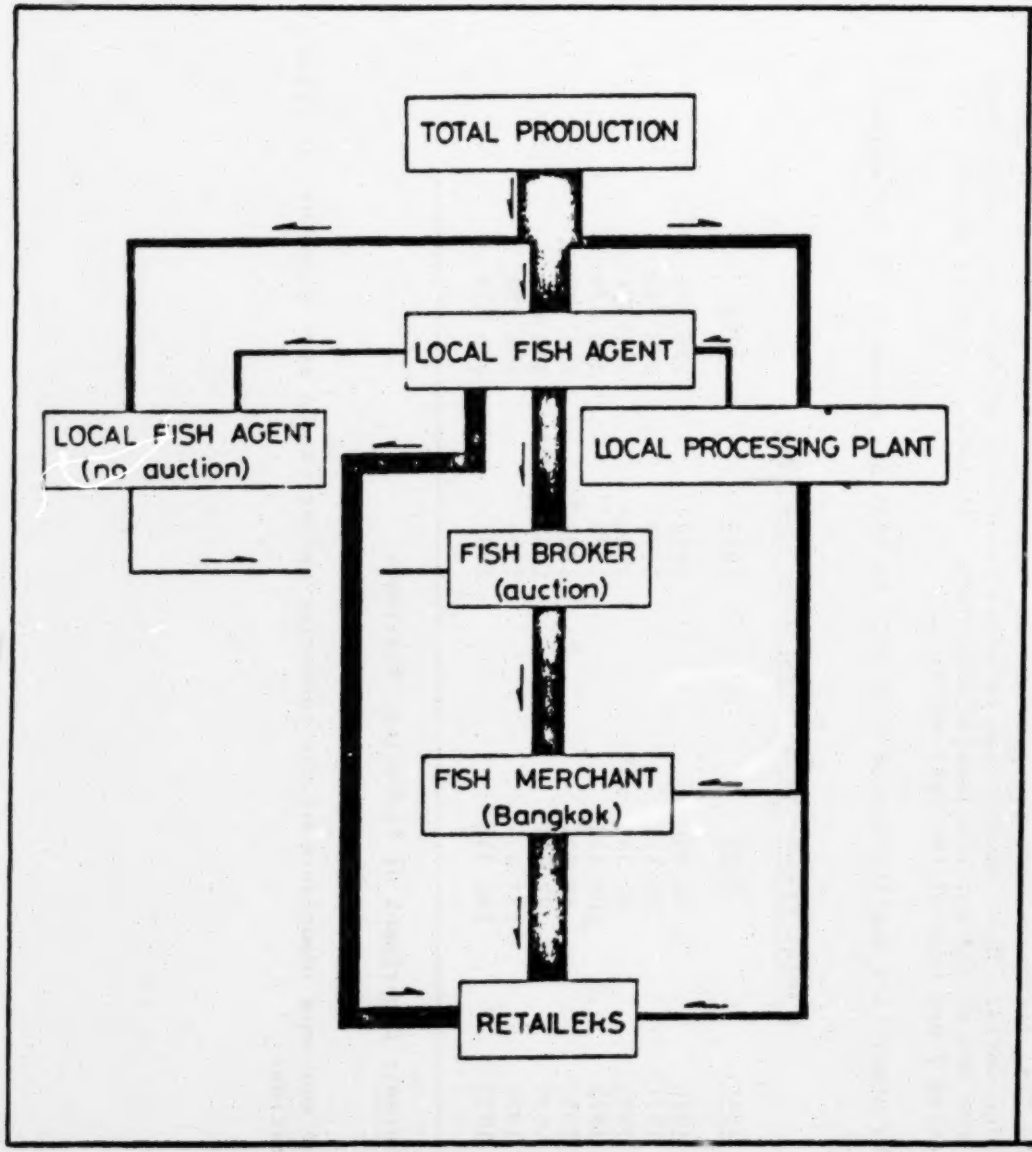
The following table indicates the figures for the utilization of marine fish during the period 1980-1984.

Utilization of marine fish by product form, 1980-1984 (in tons)

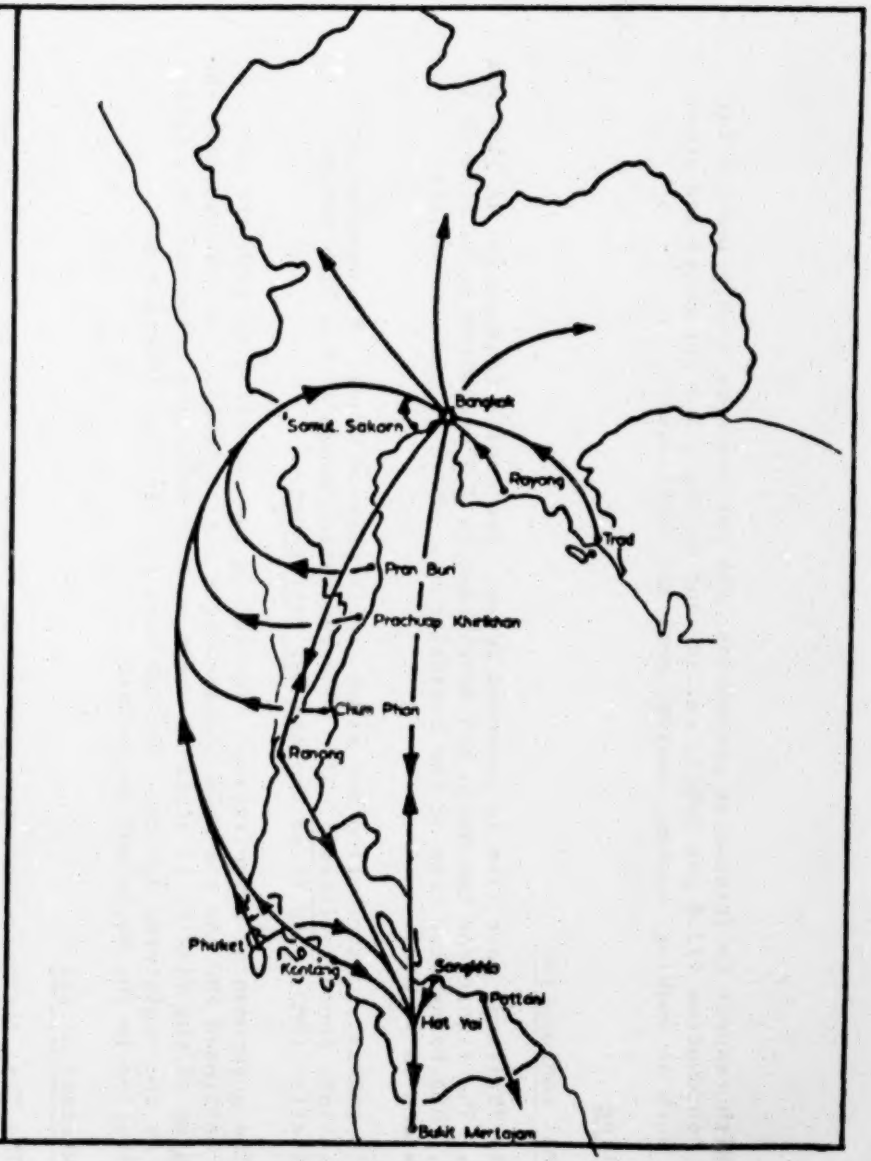
Year	Fresh consumption	Frozen	Dried and salted	Steamed or smoked	Shrimp paste	Dried shrimp	Fish-meal	Fish sauce	Canned fish	Others	Total
1980	427 989	123 873	116 320	20 844	15 099	17 497	822 834	75 024	26 818	1 655	1 647 953
1981	505 464	122 369	126 403	28 015	16 830	52 303	840 974	90 130	41 241	743	1 824 444
1982	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1983	482 115	155 573	271 684	20 581	21 376	75 449	859 958	92 290	116 283	4 677	2 099 986
1984	443 298	200 958	79 732	21 579	19 001	97 526	843 446	80 671	181 326	5 482	1 973 019

Source: Department of Fisheries, Thailand.

Note: Frozen for export.



Principal marketing channels for marine fish in Thailand.



Principal movements of marine fish by road transport in Thailand and between Thailand and Malaysia.

Source: Department of Fisheries, Thailand.

With respect to freshwater production, the catches were used primarily for fresh consumption (72.8 per cent), salting and drying (12.9 per cent) and other uses, such as smoking, sauces, pastes, meal and fertilizers.

Marketing

Internal consumption

In Thailand, most fish is consumed fresh. Per capita consumption in 1984 was 21 kg. The figure for the North and North-East is 7.8 kg, while in Bangkok it is 35 kg, this being also true of the coastal zones, where 56 per cent of the population is located.

In general, distribution and sales are in private hands. Fishmongers are divided into those registered under an organization known as the Fish Market Organization (FMO), and those who are not registered.

The governmental organizations involved in the marketing of fish are the above-mentioned FMO and the Cold Storage Organization (CSO). The FMO oversees the unloading of the fish at 12 stations where auction sales are conducted on a daily basis by the registered agents. The CSO buys the fish for freezing and distribution in the North and North-East.

The external market

The Thai fisheries industry provides an example of rapid growth within the developing world. This industry has achieved remarkable progress in recent years and is now one of the world's leading exporters. In 1982, fisheries exports represented 7 per cent of the national total.

The statistics for the period from 1970 to 1985 are shown in the following table.

Total fishery product exports, 1970-1985

Year	Tons	Year	Tons
1970	44 956	1978	235 386
1971	55 111	1979	277 896
1972	82 381	1980	262 568
1973	104 133	1981	300 036
1974	88 221	1982	295 900
1975	97 994	1983	344 681
1976	133 454	1984	406 990
1977	180 331	1985	466 219

Source: Department of Fisheries, Thailand.

The enormous importance of the canneries sector can be seen from the following presentation.

Fish and fishery product exports, 1981-1984
(in tons and millions of baht)

	1981		1982		1983		1984	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Frozen shrimp	19 699	2 081	22 647	2 764	20 211	3 165	19 430	2 798
Frozen cephalopod	39 000	1 248	42 656	1 784	39 301	1 637	42 820	NA
Fish meal	111 042	968	83 074	701	92 751	784	85 490	743
Crustacean and mollusc meal	20 289	327	20 713	377	NA	NA	NA	NA
Frozen fish	49 000	530	53 116	688	5 375	685	75 250	1 017
Dried cephalopod	2 900	450	3 565	607	3 457	630	NA	NA
Dried shrimp	1 976	180	2 217	216	2 013	197	NA	NA
Canned seafood	40 848	2 092	65 770	3 186	71 570	3 821	114 460	6 212

Source: Ministry of Commerce and MOAC, Thailand.

In recent years, canned products have become a chief factor as a result of tuna exports to the United States and Europe. Thailand also exports fresh, chilled and frozen fish to Japan, Malaysia and the United States as well as chilled and frozen cuttlefish to Japan, Italy and France.

Imports trebled between 1981 and 1985, but the bulk of this import was accounted for by skipjack tuna for canning, which is re-exported in this form. This is also true of other important items in the form of fish, crustaceans and cephalopods, that are likewise re-exported with greater value added.

Handling and processing

The fish that are to be commercially exploited require proper on-board handling, but the accompanying fish, which represent some 44 per cent, are not well preserved and their quality is generally poor. In 1983, approximately 94.6 per cent of the accompanying fish were used for the production of fish meal.

In general, the ships used for pelagic fishing are wooden-hulled vessels, of from 12 to 19 metres in length and over 20 years of age. They may spend from 10-12 hours to 4-6 days at sea. Normally they use ice in bar form and occasionally salt when their catches are intended for salting and drying or possibly for the production of sauces. A more limited number of larger vessels have small refrigerated holds, without drainage systems. The amount of ice used is normally in the proportion one part ice for every three or four parts fish.

The more valuable species caught by the trawlers are classified and placed in ice before they are unloaded. Wooden, plastic or metal cases are used, but they are very frequently inadequate.

Owing to deficient handling practices, there is a major sacrifice in quality during the unloading of the fish.

Conditions are unsatisfactory at the unloading sites. The fish are typically washed with water drawn directly from the port and placed in bamboo baskets. The small pelagic species in greatest demand are loaded in ice in baskets or wooden crates and are transported in insulated or open lorries to the most important markets in Thailand and Malaysia.

The sardines used by the canneries are bulk-loaded in ice in open lorries and transported over distances of 200 to 1,000 km.

There are 19 major unloading ports, at which 77 per cent of the country's fish is handled. There are 13 unloading stations with FMO facilities.

Processing

Backed by a system of modern processing facilities, such as cold-storage warehouses and large canneries, there is very extensive small-scale fish processing and preservation activity in the immediate vicinity of the coastal communities. The most common methods are sun-drying, salting, brining, smoking and fermenting; however, the largest proportion of the highest-quality products for export are produced by the freezing and canning industries.

The following table, referring to selected categories, indicates the number of processing plants that existed in 1984.

Plant type	Total	Plant type	Total
Shipyard	168	Dried shrimp	284
Ice plant	155	Dried squid	865
Cold-storage	78	Dried mussel	776
Canned fish	38	Steamed fish	138
Fish sauce	113	Smoked fish	184
Fish meal	95	Fish shrimp crackers	78
Shrimp paste	2 860	Fish ball	64
Salt fish	800	Nam pla	37

Freezing and cold storage

The freezing industry is very highly developed in Thailand. Fish, cephalopods and shrimp are used as raw materials. There are 44 plants authorized to export frozen products. A large number of these companies have additional facilities for the production of ice, and for handling and deep-sea fishing. Moreover, many of these plants employ adequate processing, quality control and hygenic practices, but these are not easy to introduce in the less well-developed segments of the industry. It is not unreasonable that there should be uneven standards of this kind in a branch in which development, achieved largely through imported machinery and technology, has been so dramatic.

The principal problem for the freezing industry is the quality and availability of local raw materials. The apparent alternative lies in import and in the use of high-value aquaculture products.

Canning

At present, tuna, mackerel, crab, shrimp and domestic animal feeds account for most of the canned products. Other items are clams, crabmeat, shrimp, squid and sea food cocktails. The canneries also produce tinned vegetables and fruits. There is a major trend towards the diversification of products, can sizes and sauces, designed to reflect market developments.

In 1985 the canneries used more than 100,000 tons of tuna, 35 per cent of which was caught by Thai fishermen and the rest imported.

The canneries too are suffering from the shortage of raw materials and their poor quality. In many cases, the initial processing stages are still conducted under precarious conditions and without sufficient control.

Meal

The industrial infrastructure for the production of fish meal is oversized. Some 800,000 tons of fish are annually converted into nearly 200,000 tons of meal, 50 per cent of which is exported, mainly to other Asian countries.

A particular feature is the use of mixed raw materials. In all other respects the technology employed is fairly standard.

The result is a meal of low protein content (55-60 per cent), owing to the relatively poor extraction of the oil. On the other hand, the sand content is very high, which also explains the large yield.

Because of its low quality owing to these factors, this product has failed to gain much acceptance in Europe and Japan.

Although the sector is essential to the country as a means of exploiting the large available quantities of accompanying fish, the situation of the fish meal industry is generally unsatisfactory.

"Nam pla" fish sauce

Of the traditional products of Thailand, this product merits special consideration. Exports increased from 1,000 tons in 1973 to 7,534 tons in 1982, with Asian settlers in other regions providing the market. Every year 30,000 tons of fish are used to produce a similar quantity of "nam pla". The production is centred at 96 registered plants that operate in the manner of a family industry. Many of these plants are of considerable size and their products of excellent quality.

The product is obtained as a clear liquid ranging in colour between amber-yellow and brown and having a strong salty taste and cheese-like aroma.

Traditional "nam pla" process

(a) Washing of the fish in seawater;

(b) Mixing with salt in a proportion of 1:1/1.5:1;

(c) Pressing so as to keep the fish immersed;

(d) Aging from 5 to 18 months;

(e) Extraction of the liquid;

(f) Filtration of the liquid;

(g) Exposure to the sun until the product reaches maturity;

(h) Bottling.

The Thai Science Department has developed a technique for carrying out this 6-to-12-month process within a period of 24 hours. The equipment for this work is very simple. There are different quality grades and the product is used as a condiment.

This is an example of one of the very large number of different fermented products indigenous to the Asian countries.

Other traditional products

In 1982 there were a total of 5,950 identified plants producing preparations and preserves by traditional methods. Taken together, these plants utilized 13 per cent of the raw material. The products are of the smoked, salted and dried varieties and also include various pastes and fish balls. They are generally sold in the local market.

These activities perform a very important social role, but they are often carried out under unhygienic conditions that are barely tolerable.

The quality of the dried and salted products, which are usually packed in bamboo baskets, varies greatly according to the fatty content of the fish.

Quality control

Quality control and inspection of fish in Thailand is unsatisfactory in relation to the socio-economic importance of the fisheries sector.

The existing legislation is confused and incomplete. There are a number of agencies that are nominally concerned with these tasks, but practically the only one exercising control is the Fisheries Technology Development Division (FTDD), although it lacks a clear legal mandate in this area. The inspections are carried out at the exporting refrigeration and canning plants. There is no inspection of the conditions on board the fishing vessels, at the unloading stations, or at the markets and plants supplying the internal market. Owing to the inadequate supply of local raw materials it is very difficult to lay down binding requirements of any kind in connection with either the catches or the acceptance of raw materials.

Research and training

There is an official network of fisheries research and exploration organizations whose purpose is to identify the available resources and promote scientific and technological development. The research institutes, which have received assistance from third countries for the implementation of their programmes, periodically conduct training courses in various fields.

There is also a Department of Technology Development, which is particularly concerned with small-scale fishing techniques in addition to its work in the fields of consumer education, product applications and other areas. This department has developed two mechanical drier prototypes, two smoking-unit prototypes and other processing machines. Some of this equipment has been successfully introduced at processing plants.

Principal problems

- Existence of an oversized industry;
- Overfishing of a number of important species;
- Shortage of raw materials for canning, freezing and meal;
- Deficient handling practices on board the fishing vessels, at the unloading points and in the internal markets;
- Poor conditions of hygiene and handling in small-scale processing.

Group 3

China 1/

With its catch volume of 7.05 million tons, China, in terms of its fisheries, is the world's third-largest producing country, according to data for 1985. Extending over a wide range of latitudes, from the tropical to the temperate, the country has a coastline of 18,000 km, in addition to the more than 14,200 km accounted for by its islands.

1/ INFOFISH/UNIDO Report, December 1986.

China is the world's most populous country, reporting 1,034 million inhabitants in 1984. The annual rate of population growth is 1.3 per cent and population density averages 104 inhabitants per km^2.

Fishery resources and their exploitation

Fishery activities in China cover catches and aquaculture at sea and in inland waters. The country has four distinct marine fishing zones, all extremely rich, which together produced 4.2 million tons in 1985. The balance is obtained from the aquacultural projects operating on the numerous rivers and interior lakes. The following table indicates the production figures (in thousands of tons) for the period from 1950 to 1985.

Year	Total yield	Marine		Freshwater	
		Fishing	Culture	Fishing	Culture
1950	912	536	10	360	66
1955	2 518	1 549	107	543	319
1960	3 038	1 749	121	668	500
1965	2 984	1 910	104	456	514
1970	3 185	2 097	184	322	582
1975	4 412	3 068	279	312	753
1980	4 497	2 813	444	338	901
1985	7 052	3 485	712	475	2 379

Total fisheries production represents 1 per cent of the agricultural gross product. The latest increments have been due mainly to the increase in freshwater aquaculture production.

Fish production, 1984-1985 (in thousands of tons)

	1984	1985a/	Rate of increase (%)
Capture fisheries			
Marine	3 305	3 485	5.4
Freshwater aquaculture	439	475	8.2
Coastal	639	712	11.4
Freshwater	1 810	2 379	31.4
Total	6 193	7 052	13.9

a/ INFOFISH/UNIDO Report, December 1986.

Output of aquatic products by category (in tens of thousands of tons)

Item	1983	1982	1983 as % of 1982
Total	545.8	515.5	105.9
I. Seawater aquatic products	361.7	359.4	100.6
By origin			
1. Naturally grown	307.2	309.9	99.1
2. Artificially cultured	54.5	49.5	110.1
By category			
1. Fish	251.4	257.9	97.5
2. Shrimp and crabs	49.1	46.9	104.7
3. Shellfish	36.8	31.7	116.1
4. Algae	24.4	22.9	106.6
II. Freshwater aquatic products	184.1	156.1	117.9
By origin			
1. Naturally grown	42.0	36.2	116.0
2. Artificially cultured	142.1	119.9	118.5
By category			
1. Fish	175.9	148.0	118.9
2. Shrimp and crabs	5.6	5.5	101.8
3. Shellfish	2.6	2.6	100.0
III. Of seawater aquatic products			
1. Greater croaker	3.4	5.9	57.6
2. Lesser croaker	2.9	3.1	93.5
3. Hairtail	45.2	49.3	91.7
4. Scad and mackerel	36.6	28.8	127.1
5. Kelp	23.1	21.9	105.5

Marine fisheries

This heading includes catches in distant waters and also the mariculture harvests. China is able to exploit a very rich continental platform as well as 4.73 million km^2 of territorial waters. Many large rivers, such as the Yangtze, the Yellow and the Pearl, discharge their nutrients into the sea, creating extremely favourable conditions that have ultimately led to the development of the world's richest platform with its great variety of fish, molusc and crustacean species.

Marine fishing is basically conducted down to the 100-metre isobath, where the situation is one of overexploitation. The most heavily fished species are the croakers (Sciaenidae), the mackerel and the shrimp. The marine fisheries provide about one-half of the total supply.

More than one million persons are engaged in marine fishing, using 109,000 motorized vessels owned by State enterprises, co-operatives and private operators. About 75 per cent of these crafts are small trawlers.

Mariculture

Mariculture is practised in the coastal estuaries and in the various bays and inlets along the coast, where conditions are excellent. There are two forms of operation: intensive and semi-intensive operations, in lagoons of approximately two hectares; and extensive operations, over areas of 200 hectares, to cite what may be typical figures.

The total area devoted to mariculture, which is proving to be the most suitable method for increasing the production of high-value species for consumption and export, is about 300,000 hectares. The hope is for an annual growth rate of 11.4 per cent during the period 1985-1990, leading to a goal of 1.2 million tons at the end of that time.

Freshwater fisheries

Fish culture, which is highly developed in China, dates back 2,000 years in that country. The projects are concerned with the raising of fish and bivalves. China has 20 million hectares of rivers, lakes, reservoirs and lagoons, as well as canals and floodable zones. These assets are still very substantially underutilized.

Freshwater production is controlled by State and collective farms. In 1985 catches amounted to 475,000 tons, representing 6.7 per cent of the national total. The species taken include carp, white bream, hilsa, sturgeon, salmon, eels, turtles, crabs, shrimp and others.

Some 43,000 vessels are engaged in inland fishing.

Freshwater culture

Freshwater fish culture is being promoted with a view to improving the supply for the internal market. China is the world's leader in this field, cultivating an area of more than 3.4 million hectares, including, in 1985, 1.25 million hectares in the form of pools. Production that year exceeded 2.4 million tons, the principal varieties being carp and tilapia. Most of the production is internally consumed. Average productivity per hectare/per annum is 4.3 tons.

Incentives are being offered for the conversion of paddy fields and other areas to fish culture use as a means of increasing production through extensive operations with a yield of 0.8 tons per hectare/per annum.

A particular feature of this area of activity is its integrated, polycultural aspect consisting in the combination of agriculture with the raising of crustaceans (macrobrachium) and fish, mainly carp. The greatest problem has to do with the fish diseases, which are difficult to control. Fish culture is becoming a technically oriented professional activity that is growing in scale from year to year.

Fisheries infrastructure

There are more than 700 large and small ports along the coast, 300 of which offer adequate facilities. The facilities in question pertain to utilities, cold storage, housing, transport, schools and medical services.

The fleet is relatively modern. In general, it consists of steel-hulled vessels, trawlers operating alone or in tandem, with a typical length of 30-40 metres. There are also smaller purse seiners, but as a general rule, except in the southern provinces, there is nothing that might be classified as small-scale fishing.

Fishing gear and vessels are produced on a large scale by State factories. The latter employ a total of 50,000 workers and annually produce 100 steel-hulled trawlers as well as motors, winches, nets and other articles. They also provide repair services and furnish refrigeration and processing equipment.

Since 1970, there has been large-scale construction of 600-H.P. trawlers, in addition to which a number of large purse seiners have also been built. The intention is for the country to build 50 shrimpers for the southern zone, using imported engines and electronic equipment.

Use of the catches

Internal consumption

Despite the large volume of production, per capita consumption in China is low, in the order of 5 kg/year. There appear to be possibilities for increasing this indicator through a policy of moderate population growth and an expansion of the aquaculture sector. This is necessary if the Government's aim of shifting the Chinese diet away from cereals towards more fish, meat, eggs, milk, fruit and vegetables is to be realized.

Within the framework of China's planned economy the market is not regulated by supply and demand; the balance is planned and adjusted by the Government. There is provision in the plan for each province or municipality, and these have marketing enterprises that operate their own transport and storage facilities. The system is being modified to allow for greater flexibility through the interplay of market forces. The quantity of fish each consumer is entitled to buy is governed by a coupon system. The State-operated markets are large and modern and account for the distribution of 80 per cent of the total fish volume.

Internal transport is difficult and relies mainly on boats and trains, which in fact provide the sole means of access to many rural zones.

In principle, originally only the supply and marketing co-operatives were authorized to transport and distribute fish. At present, however, the fishermen are permitted to sell their products at a number of unregulated markets.

There are two price mechanisms: fish sold under the official quota is subsidized at 33 per cent; for fish that is directly sold, the price is freely set.

Handling, processing and quality control

On-board and on-shore handling

There are many methods of shipboard handling, depending on the type of vessel and the fish variety in question. In general terms, many procedures are carelessly performed, and when measured against the normal standards expected in modern industrial operations the conditions of preservation and storage are distinctly inferior. Only a limited number of vessels have insulated cargo compartments, freezers and other equipment; some, used for transport, employ chilled seawater. When the species are of low commercial value, they are not treated as food.

By the time the fish is unloaded from the vessels, the quality has already beenm seriously impaired, especially in the case of the small pelagic varieties. Certain more valuable species are handled more carefully and ice is used.

The situation with regard to the post-harvest treatment of cultured fish is different. In a number of areas in the South-East, the fish are transported live in tanks to the local markets or even exported to Hong Kong. There are considerable losses, which may range between 20 and 50 per cent, owing to the poor transport conditions caused by inadequate airation or shading systems on the vehicles.

In general, the problems in respect of quality are the result of improper handling both on the fishing vessels and on land. In the summer, even using a fish-to-ice ratio of 1:1, there are losses owing to delays.

Many plants fail to provide adequate conditions for the reason that they were not originally designed for the handling of fish. The more recently built factories, on the other hand, employ appropriate handling techniques.

In the case of exports, a health certificate is issued by the China National Import/Export Commodities Inspection Corporation.

Processing technology

Prior to 1950, simple, traditional processes were used, such as salting, drying and smoking. It was at that time that the development of the processing industry began on a large scale.

Today there are 430 factories employing more than 50,000 workers in all of China. The 240 State facilities annually process nearly 2 million tons of raw material for the production of 1,480,000 tons of products.

Considered on a weight basis, the four product types are as follows:

- Frozen 72%
- Canned 8%
- Dry-salted 13%
- Cooked 4%

Other traditional types, such as the "surimi" type, have in recent years been promoted through a policy of incentives.

The fisheries industry also provides inputs to other industries, such as the pharmaceuticals, printing, textiles and others.

As a whole, the industry requires better basic facilities, modernization and diversification. The technology employed in locally manufactured equipment is not up to date. Labour productivity is relatively low when measured against the standards of other regions.

Freezing and cold storage

There are 370 cold-storage facilities of various size, with a capacity of 250,000 tons. The freezing capacity is 7,000 tons/day and the ice storage capacity is 190,000 tons. The plants are distributed along the coast.

The freezing operation is performed using equipment of the contact or cold-air type, producing large blocks.

Smaller packaging is beginning to be introduced in line with the improved standard of living. Individual frozen products are not yet in use, but there is interest in this technology.

The Chinese refrigeration industry is characterized today by cheap labour and inexpensive raw materials and by the beginnings of quality control. The principal products are frozen fish and shrimp of marine origin. Quality and production losses occur when the plants are operating at the limit of their capacity.

So far, owing to the lack of the appropriate technology and installations, not much use has been made of bivalves for freezing and canning.

Canning

The installations of the canning industry are not up to date, nor is there a sufficient number of viable product lines.

The canned products registered with the United States Food and Drug Administration include: fried carp, fried anchovies, sardines, mackerel, sea eels, clams, cuttlefish and species. The various products are used in typical Chinese dishes, such as spiced fried fish, fish with fermented soya sauce, etc., and are packed in glass for the local market and canned for export. The largest share of the export products is destined for overseas communities of ethnic Chinese. The limited variety and quality of the packaging and the relatively poor visual impression are typical features of these products. There is interest in modernization, particularly with regard to easy-to-open packaging.

Drying

About 50 per cent of the marine catch volume is dried or dry-salted, including fish, shrimp, mussels and other varieties. The related operations are performed using traditional methods. The product is transported to the consumer over long distances. Improvements in quality will lead to an expanded market. The larger plants also use hot-air drying tunnels. Recently, sizeable quantities of filefish have been produced and exported to Japan. The filefish is manually filletted, but the operation is performed in an extremely hygienic manner. The final product is very dry, its weight at this point being about 8 per cent of the initial value.

Other processes

Some 56 plants are engaged in the processing of algae for the production of alginates and iodine. Although their equipment is of reasonable quality, the installations are old, with the result that the products are of poor quality.

Shark liver oil, including the tablet- and capsule-form products, is produced for medicinal purposes. Sophisticated machinery is available for the encapsulation of fish liver oil.

Chinese industry also produces meal, oil and peptone, with the latter used as a bacterial culture medium. The meal is produced with the residue of other processes and accompanying fish, the final product being of low quality.

The organization of the industry

The fisheries sector is ultimately subordinate to the Ministry of Agriculture, Animal Husbandry and Fisheries (MAAF), the Bureau of Aquatic Products (BAP) and the Bureau of Fisheries Management and Fishing Port Superintendence (BFM).

BAP is involved in the development of fishery activities, while BFM is responsible for administration and regulation. Beside these bodies, there also exist special agencies and organizations or enterprises engaged in distribution and marketing.

Research and Training

At present, the Government ascribes major importance to training at different levels. There are 15 locations with institutions that are devoted to training and offer high-level courses, their enrolment totalling more than 6,000 students. The study programmes include marine fishing, resources, aquaculture, refrigeration, economics, organization, shipbuilding and ship repair, processing technology, electronics and other subjects.

In addition, at the intermediate level there are 16 schools attended by 5,000 students, as well as short-duration training courses organized jointly by the schools and production enterprises.

China has more than 100 fisheries research institutes and nearly 1,000 technological stations engaged in biological and fisheries research and also in technological studies. The aim of these institutes is to introduce new processing technologies and to develop a broad range of products, mainly in the area of techniques to allow more effective resource utilization.

Conclusions

- Considering that unexploited marine and continental resources continue to be available, in 1979 the Government formulated a fisheries development policy.
- Many problems having to do with shipboard handling, transport and processing remain to be solved.
- There is an evident shortage of technology and equipment for the proper processing of the products.
- There is a lack of well-organized internal distribution channels for the stimulation of fish consumption in a number of areas.
- The per capita consumption of fish is low at the same time that there is a need for a change in the national diet in the direction of greater variety.
- The possibilities exist for putting to use a number of underutilized species and adding greater value and quality to a great many products.
- It is necessary to develop adequate containers and crates for use in the transport of intermediate products, as well as proper packaging for the finished products.

Principal problems

- The consumer's tastes are limited to traditional products, which poses an obstacle to the rapid introduction of other resources.
- The handling and processing infrastructure needs to be newly adapted and modernized.
- Distribution is sluggish owing to the lack of efficient transport facilities.
- Not enough foreign technology is being imported to keep pace with the requirements, whereas domestically developed technology for the processing industry is inadequate.

Annex I

Output of aquatic products (in tens of thousands of tons)

Year	Seawater aquatic products				Freshwater aquatic products		
	Aquatic products	Sub-total	Naturally grown	Artificially cultured	Sub-total	Naturally grown	Artificially cultured
1949	45	-	-	-	-	-	-
1950	91	55	54	1	36	30	6
1951	133	81	78	3	52	40	12
1952	167	106	100	6	61	47	14
1953	190	122	115	7	68	50	18
1954	229	139	130	9	90	62	28
1955	252	166	155	11	86	54	32
1956	265	171	164	7	94	60	34
1957	312	194	182	12	118	61	57
1958	281	171	162	9	110	55	55
1959	309	186	175	11	123	63	60
1960	304	187	175	12	117	67	50
1961	231	143	134	9	88	53	35
1962	228	150	141	9	78	47	31
1963	261	176	167	9	85	49	36
1964	280	188	180	8	92	52	40
1965	298	201	191	10	97	46	51
1966	310	218	206	12	92	40	52
1967	305	219	205	14	86	36	50
1968	271	192	178	14	79	30	49
1969	290	205	189	16	85	30	55
1970	318	228	210	18	90	32	58
1971	350	256	233	23	94	32	62
1972	384	291	266	25	93	31	62
1973	393	291	269	22	102	36	66
1974	428	325	300	25	103	32	71
1975	441	335	307	28	106	31	75
1976	448	342	312	30	106	32	74
1977	470	362	320	42	108	31	77
1978	466	360	315	45	106	30	76
1979	431	319	277	42	112	30	82
1980	450	326	281	45	124	34	90
1981	461	323	277	46	138	36	102
1982	516	360	310	50	156	36	120
1983	546	362	307	55	184	42	142
1984	620	395	331	64	225	44	181
1985	706	420	349	71	286	48	238

LATIN AMERICA AND THE CARIBBEAN

Introduction

Within the family of developing countries considered in this report, the group represented by Latin America and the Caribbean exhibits very special characteristics marked by widely dissimilar situations and pronouncedly different socio-economic levels from one country to another and even within the same country, as in the case of Brazil.

With specific respect to food habits, the situations differ greatly in terms of the composition of the diet, which in any event includes hardly any fish, the consumption of which is in fact the lowest for the three groups of developing countries considered. In terms of the number of calories consumed, Argentina is among the countries with the highest daily level in the world, with more than 3,200 calories/day, while, at the other end of the spectrum, Haiti with its 2,000 calories/day ranks among the most deficient countries in this respect. When the countries of the region are classified according to this criterion, their standing is as follows:

More than 3,200 calories:	Argentina. 1/
From 2,801 to 3,200 calories:	Mexico, Paraguay and Uruguay.
From 2,401 to 2,800 calories:	Brazil, Venezuela, Colombia, Chile, Suriname, French Guyana, Belize, Costa Rica, Cuba, Jamaica and other Caribbean islands.
From 2,000 to 2,400 calories:	Guatemala, Honduras, El Salvador, Nicaragua, Panama, Ecuador, Peru, Bolivia and the Dominican Republic.
Less than 2,000 calories:	Haiti.

For the purpose of providing a clearer and more informative analysis, we shall endeavour to examine each of the countries considered in the region from the point of view of its fishery activities.

It may be that this approach will prove more useful than a detailed study of the statistical data, which in any case are normally incomplete and often not overly reliable owing to the fact that there is no monitoring of the activities involved and the relevant information is gathered in an unsystematic manner.

In 1983 Latin America contributed 11.8 per cent of world fisheries production and in 1984 14.1 per cent. In addition, the growth, in relative terms, in regional fishery activities during the period 1983-1984 totalled 25.5 per cent, while the world average was only 5 per cent. 2/

Independently of purely quantitative estimates, we can also consider a number of other key aspects relevant to the description of the fishery activities of each country and of the region as a whole.

1/ Source: FAO, 1979-1981.

2/ Source: Latin American Organization for the Development of Fisheries (OLDEPESCA).

For example, Japan is the world's leading fisheries country with some 10 million annual tons, but, in addition, the inhabitants of that country are also the biggest per capita consumers of fish, which in Japan is directly intended for use as an ingredient in the human diet.

On the other hand, in the Soviet Union, the second-largest producer, a major portion of the aggregate fish haul is channelled to the feeding of that country's farm animals.

China, the country in third place, exhibits a very different pattern, with much of its production originating from fish that are artificially raised in inland waters and are consumed in their entirety in the internal market.

Applying this type of analysis and taking into account the various intervening factors, it is fair to say that the Latin American region is noteworthy for the large-scale production of fish meal in Chile and Peru coupled with disproportionately high catch statistics in relation to the consumption by the population of the area. Or, put differently, although in terms of production the region occupies a leading position, the fisheries sector in Latin America does not represent a traditional activity deeply rooted in the culture of that region's peoples.

In other words, the consumption of fish can be assessed by observing the figures for the daily supply of various kinds of food in different regions of the world.

In Latin America, fish-derived protein accounts for 3.88 per cent of the diet, a relatively low value in comparison with that of other traditionally fish-consuming regions. With respect to calories, the figure of 0.57 per cent obtained from fish is the lowest outside of Africa. Accordingly, the significance of fishery activities in Latin America derives more from the relative economic importance that attaches to this sector in certain countries than from the use of its products in the diet of the population.

In a certain sense, an opposite pattern can be observed in the countries of the Caribbean area, where in many cases the fisheries trade-balance results are negative, although per capita consumption is of the same order as in Latin America.

Moreover, when the products obtained through fishing are intended for export, the related activities are conducted on an industrial basis and at a high technological level; on the other hand, when the products are consumed exclusively in the domestic market, the operations tend to be of a rudimentary and small-scale nature.

A noteworthy consideration is the social importance of the small-scale fisheries sector as a result of the large number of persons that it directly employs in such countries as Chile, Peru, Colombia and Brazil, and owing also to the fact that the tasks specific to this activity are carried out in zones where other employment opportunities are in short supply.

The situation identified in the Latin American and Caribbean region with respect to the production and consumption of fish and other bio-aquatic resources must be interpreted not only in the context of the economic and social conditions of the peoples of this region, who together total nearly 400 million inhabitants, but also in the light of the changes that have occurred in the composition of production and the technological advances that have been achieved.

Not only improvements in production systems, but all instances of progress towards national or regional technological self-sufficiency must be viewed as technological advances. These achievements make possible the use of "appropriate

technology" so as to harmonize the higher output levels with the production of foods that both satisfy local consumption habits and are within the purchasing power of the population.

For this group of countries, however, a common development in recent years has been an expansion of export-oriented industrial-scale fishery activities that, at least in some cases, has worked to the detriment of internal supply. In fact, while the region is currently producing and exporting the kind of high-demand fisheries products - such as tuna, shrimp, prawns, lobsters, shellfish, etc. - that are of great commercial value and ensure the most profitable return, the priority should be to use the fisheries sector to satisfy the requirements of middle- and lower-income population groups by making available foods for human consumption through the exploitation of species that can be caught at low cost and that are currently being used for the manufacture of animal feeds or earmarked for processing into salted, dry-salted and other products.

Nevertheless, the economic situation of these countries is such that there is a need for continued progress towards an improvement in the trade balance for fisheries products, as well as in the general trade balance, particularly in those of this group of countries where the consumption of fish represents a burden on the national economy.

In some cases the improvements introduced in the economy through the increases recorded in fisheries production are not of the magnitude that might have been hoped for. This is because these increments have been achieved by transnational fleets operating under a variety of accords or agreements that, while they may well lead to larger export volumes, do not produce the same multiplier effects or generate the same number of jobs as do the national industries.

A cursory survey of the composition of production indicates an encouraging trend, marked in particular by an average increase of 6 per cent per annum in the volume of processed products available during the period 1980-1984. What is even more important, however, is that there has been a reduction in the overall relative quantities of fish meal.

Cuba, Mexico and Peru have been noteworthy in recent years for their efforts to find production alternatives for those varieties that might be used, to a greater degree than is currently the case, for direct human consumption.

Description of the characteristics of fisheries activities in some countries of the Latin American and Caribbean region

By way of example, using specific situations identifiable within the region, a selection has been made of a number of countries that will be separately discussed below. For the sake of brevity, the intention has been to avoid excessive detail and to endeavour instead to highlight those aspects that relate to the overall importance of the fisheries sector together with the particular features of the processing infrastructure, the type of products and the consumption habits typical of the country in question. Accordingly, we shall leave aside the problem of resources, their quantification, fishing equipment and methods, the fishing ground and the species exploited - all matters dealt with in another paper - in order to concentrate on the technological aspects of the processing together with the difficulties and limitations encountered.

Criterion for the selection of countries

The countries of the region were classified according to the type of fishery activity - small-scale or industrial-scale - that best characterizes them, taking into account also the volumes produced. In this way, the following groups were identified:

1. Large producers of fish meal:

- Chile — Selected: Chile
- Peru
- Ecuador

2. Exporters of high-value products:

- Ecuador — Selected: Ecuador (an additional reason being that this country is also a major producer of artificially raised shrimp, making it an exporter within this group)
- Mexico
- Argentina
- Uruguay

3. Exporters of whitefish:

- Argentina — Selected: Argentina
- Uruguay

4. Countries with sizeable small-scale inland fisheries:

- Colombia — Selected: Colombia
- Brazil
- Others

5. Countries, in the Caribbean zone, with limited resources and limited development:

- Dominican Republic — Selected: Dominican Republic
- Haiti
- Jamaica
- El Salvador
- Costa Rica
- Others

Argentina

Introduction

In the evolution of the Argentine fisheries industry there have been three stages since operations first began to be conducted on a larger scale. The first of these stages was represented by the salting of small anchovy ("anchoita") varieties using small-scale methods in order to produce the typical salted anchovy, which ultimately came to be exported to Europe in substantial quantities. During the 1950s the leading role in this sector was taken over by the more clearly industrial-scale activity of canning, whose principal product was based on this same species, ("engrauli anchoita"), from which the preparation known as the "Argentine sardine" was developed. In addition, during the period of the late 1940s and early 1950s, the fish-meal industry was built up on the basis of the allis shad catches taken in the Paraná River. Subsequently, the mid-1960s saw the first phase in the development of the freezing industry, which currently constitutes the basis of the country's fisheries exports. In value terms, these exceeded $US 200 million in 1979.

General data

Continental area	2 779 741 km^2
Continental platform	1 000 000 km^2 approximately
Seacoast	4 000 km approximately
Population	30 096 918
Delivery of fish per inhabitant	3.6 kg/year
Catch volume (1985)	407 000 tons
Estimated employment	
- Primary sector:	4 000 persons
- Secondary sector:	10 000 persons

Description of the Argentine fisheries sector

Argentina is a riparian State with highly accessible fisheries resources available in quantities that justify the existence of a major fishing and processing infrastructure, and in concentrations that provide a basis for economically sound operations, i.e., in terms of the production/gross registered tonnage ratio.

The principal species - apart from the small anchovy - are normally in heavy demand in the external market, and this fact, coupled with the relative lack of taste for these products on the part of the Argentine consumer, prompted the industry to adopt a distinctly export-oriented attitude. In this same connection, with its total (and stable) internal consumption figure of some 100,000 tons of fish catches a year, Argentina, at 0.25, has one of the lowest internal consumption/export ratios for a major fishing nation.

A further interesting characteristic of this industry is its great dynamism and consistent speed of recovery, as well as the extraordinary multiplier effect that it exerts in those regions with the largest concentrations of processing facilities.

Argentina is an exporter of "frozen" fisheries products owing to the natural characteristics of its basic species resources and the international demand for them.

In contrast to those countries that have exhausted the resources of their coastal waters and are burdened with idle fleets and an inactive work-force, the situation in Argentina is such that the State has come under international pressure to conclude agreements permitting foreign fleets to fish its alleged "surplus" stocks. However, the national industry is so structured that, with the necessary modernization of the fleet, it is quite capable of exploiting all the fisheries resources for which there is a reliable market.

The operations are conducted on what is definitely an industrial scale, although many of the enterprises are not large. The technology employed and the conditions of sanitation are adequate, vessels are built in the country, and there is domestic manufacture of fishing gear, industrial machinery and other related items. Import is limited to certain electronic navigation devices and marine engines, whereas Argentina has, for its part, exported turnkey processing plants as well as numerous refrigeration installations and many kinds of processing equipment.

The actual fishing is performed by 322 wooden-hulled coastal vessels (10-25 m), 122 near-shore trawlers (25-55 m) and 42 refrigeration trawlers and factory ships. The fleet is adequate in size, but its average age is 20 years.

Prior to 1980 the main products were frozen hake (hibbsi) fillets, various whole-frozen demersal species and whole-frozen squid. In recent years there has been dramatic growth in the catches, freezing and export of shrimp taken off the Patagonian coasts, which have come to account, in value terms, for one-third of national fisheries exports.

The industrial processing capacity is generally underutilized. The refrigeration and freezing industry operated during the period 1978-1984 at between 30 and 45 per cent of its capacity. Between the years 1981 and 1984, the canning sector operated at 40 to 50 per cent of its capacity and, during the same period, the wet-salting industry at 20 to 25 per cent of its potential.

The supply base for the fish-meal industry is very limited since it uses only the waste material left over from other processes or else fish of no value, which represents only a negligible fraction of the catches.

Product quality is in accordance with the requirements of the international markets, mainly those of the United States, Europe and Japan. There are official health and quality-control procedures for exports and, beyond that, health inspection requirements for all products. In addition, there are national standards that have been brought into line with international norms.

The State is not involved in the production activities, but does exercise a regulatory function over the sector through the Subdepartment of Fisheries, which issues fishing permits to private operators, determines the abundance of the resources and establishes the fisheries policy.

Principal limitations

- The sector's excessive dependence on a highly changeable external market and its extreme sensitivity to shifts in economic policy;
- The lack of continuity and clarity in sectoral policy, which is heavily influenced by changes in the Government;
- The obsolescence of the fishing fleet, with the result that its operational capacity is greatly diminished and raw material costs are too high;
- The negative impact of transport charges on exports to the principal markets; the need for greater regional integration;
- The high costs of packaging materials, particularly in the canneries branch;
- The need for the technological modernization of the cannery facilities and for the introduction of more modern packaging;
- The high costs of demersal and pelagic fishing, resulting in the importation of raw materials for the canneries sector and the uncompetitiveness of Argentine frozen products in the external market.

Argentina. Summary of statistical data

Coastal and demersal resources (in tons)

Species	Maximum sustainable yield	Argentine catches 1979	Argentine catches 1984	Uruguayan catches 1983	Authors
North of 48° SL					
Hake	380 493	370 859.7	174 944.8	79 700	Verazay and Otero, MS
Squid	186 609	83 578.9	28 466.9	3,600	Bezzi et al., MS
Prawns	18 000*	4.1	18 618.8		Estimated
Other high-sea	56 990	19 156.6	15 862.2	700	Bezzi et al., MS
Other coastal	115 021	32 149.8	27 605.2	34 600	Otero and Ibañez, MS
					Otero et al., 1982
South of 48° SL (Falkland Islands sector)	446 000	3 352.4	1 290.4		Otero et al., 1983
Of low economic yield	179 040	3 194.2	2 443.3		Otero et al., 1982
Other fish	No data	11 590.4	1 702.7	200	No estimate.
Other shellfish	No data	4 313.2	3 603.3		No estimate.
TOTAL	1 379 047	528 199.3	274 537.6	128 800	

Source: INIDEP (compilation).

* The maximum catch estimate for prawns is based on catch data for this species in 1983 and 1984.

Exports
(in thousands of $US)

Type of exported product	1978	1979	1980	1981	1982	1983	1984
FROZEN	140 713.2	194 659.6	122 981.3	123 012.6	173,555.3	168 440.7	141 070.4
Whole and H & G	37 480.1	49 122.0	48 625.6	68 635.1	77 737.3	53 329.5	24 579.7
Fillet	59 735.7	83 775.7	64 462.0	36 887.0	48 030.8	37 398.9	19 652.5
Squid	42 283.1	58 514.8	7 396.5	5 756.4	22 033.7	15 182.7	14 382.8
Other forms					1 667.0	2 105.4	1 849.8
Prawns	1 214.3	3 247.1	2 497.2	11 744.1	24 086.5	61 424.2	80 605.6
CHILLED	8 740.8	10 691.7	9 189.7	5 379.1	4 191.7	2 203.2	2 303.1
By air	2 701.2	2 848.7	2 433.4	2 764.0	2 443.9	2 046.0	1 583.7
Unloading of Argentine ships in Brazil	6 039.6	7 843.0	6 756.3	2 603.9	1 737.4	157.2	719.4
By land				11.2	10.4		
OTHERS	9 621.6	8 440.0	10 825.5	6 022.6	7 149.3	6 650.6	5 735.0
Dry-salted, in brine, etc.	2 113.6	3 193.1	4 871.8	3 237.0	4 133.3	4 430.2	4 034.5
Canned	2 511.5	2 693.1	2 779.4	1 279.3	1 300.5	977.4	1 091.9
Algae and by-products	2 436.1	1 956.1	3 172.3	1 121.0	1 051.3	592.4	355.7
Meal	2 404.1	523.5		394.3	643.3	572.4	252.9
Oil	111.1	74.2	2.0				
Others	45.2				20.9	78.2	
TOTAL	159 075.6	213 791.3	142 996.5	134 414.3	184 896.3	177 294.5	155 780

Source: Subdepartment of Fisheries.

Plants according to processing activity

Activity	Number		
	Buenos Aires region	Patagonian region	Total
Processing and filleting	66	6	72
Freezing and preservation of frozen fish	8	-	8
Filleting and freezing	63	23	86
Salting	40	1	41
Canning	23	3	26
Meal and oil	8	3	11
Smoking	1	1	2
Drying	2	1	3
Others	1	1	2

Source: Fisheries Industry Institute (INIDEP) survey, 1982 (Bertolotti et al., 1983), brought up to date in accordance with the data of the National Animal Health Service (SENASA). Of the total number of plants, SENASA service was withdrawn from 24 during 1984. Sixteen plants were engaged almost exclusively in the processing of prawns.

Production capacities expressed in tons of raw material

Categories	Production capacities expressed in tons of raw material	Maximum sustainable yield
Processing and filleting Freezing and preservation of frozen fish Filleting and freezing	995,000 (annual)	742,298
Dry-salting (hake)	14,000 (annual)	
Dry-salting (angelfish, monkfish)	2,000 (seasonal)	11,709
Wet-salting (small anchovies)	15,916 (seasonal)	
Canning (small anchovies)	12,728 (seasonal)	451,234
Canning (mackerel)	65,000 (seasonal)	?
Canning (bonito)	18,000 (seasonal)	?
Meal	556,000 (annual)	179,040 + 330,000 (waste)

Source: INIDP.

Processed fisheries products
(in thousands of tons)

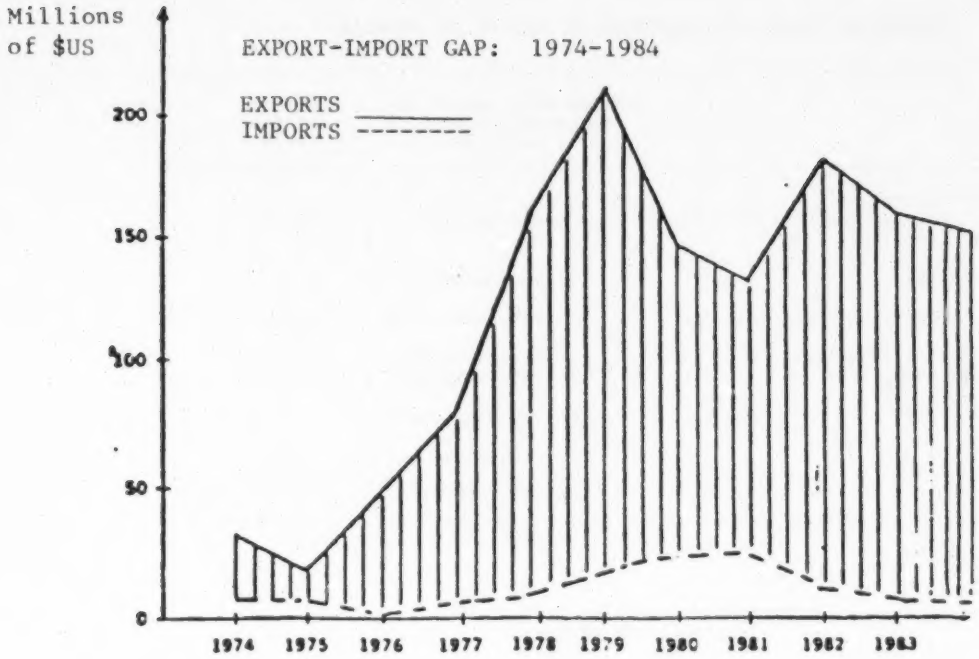
Products	1978	1979	1980	1981	1982	1983
Fresh or refrigerated	90.4	98.6	84.1	77.3	78.4	70.7
Frozen	178.7	215.4	132.2	129.8	218.2	192.6
Canned	16.7	18.8	14.4	15.1	13.2	13.6
Dried, salted, etc.	6.0	5.7	5.7	6.1	5.2	5.1
Meal	20.2	33.1	28.2	22.0	21.0	17.0
Oil	1.0	1.0	1.0	1.0	1.0	1.0

Source: SSP.

Catches, exports, imports: trade balance (1967-1984)

Years	Catches	Exports (tons)	Exports (thousands of $US)	Imports (tons)	Imports (thousands of $US)	Balance (thousands of $US)
1967	195 060.2	17 196.0	4 054.0	4 422	2 214 805	+ 1 839
1968	187 051.7	11 075.0	2 471.9	11 486	3 905 309	- 1 433
1969	169 115.7	8 734.0	2 828.7	10 609	4 026 306	- 1 197
1970	185 837.6	12 895.0	4 814.0	7 399	3 868 164	+ 946
1971	201 746.1	14 064.0	5 729.2	18 949	6 578 566	- 849
1972	211 417.7	28 040.0	9 011.1	15 307	4 311 771	+ 4 699
1973	270 135.7	27 396.0	14 029.4	2 906	1 829 874	+ 12 199
1974	266 749.1	64 927.0	33 642.0	4 453	6 237 578	+ 27 404
1975	199 067.5	58 467.0	19 495.1	6 512	7 091 306	+ 12 404
1976	256 206.1	113 075.0	48 501.5	1 315	2 431 491	+ 46 062
1977	369 433.1	158 231.8	89 389.4	9 681	7 109 597	+ 82 279
1978	504 135.9	216 075.8	159 075.6	9 206	9 954 447	+149 122
1979	550 263.0	248 715.0	213 791.3	11 313	18 310 646	+195 480
1980	376 865.3	161 338.6	142 996.8	13 897	24 328 505	+118 668
1981	351 856.0	147 298.5	134 414.5	-	25 844 600	+108 569
1982	459 648.0	232 035.2	184 896.3	-	13 952 900	+170 943
1983	401 770.8	198 411.1	177 294.5	-	*7 418 800	+169 875
1984	305 484.8	126 533.8	155 780.0	-		

* Up to and including the month of November.



Chile

Introduction

Chile is a country that, with a total area of more than 1.6 million km^2, faces the Pacific Ocean along a coastline extending over a length of 4,200 km (excluding its Antarctic territory). These conditions, together with the fertility of its waters, are responsible for Chile's current ranking as one of the leading fishing nations in terms of the volume of resources extracted from the sea, and are a guarantee that the country will enjoy a promising future provided that it is capable of properly managing and rationally exploiting its hydro-biological resources.

During 1985 the country's territorial waters yielded nearly 4.8 million tons of various marine resources, of which more than 4 million tons were recovered by the industrial-scale fisheries, with the rest either accounted for by small-scale operations or consisting of a variety of products, including artificially cultured species.

In recent years there has been a notable increase (of as much as 704 per cent in 1984 over the 1973 figures) in the volume of fishery catches and processing. This achievement was due to a combination of factors and efforts, such as the application of new technologies, greater labour productivity and specialization, efficient business management, and a sound national fisheries policy that has encouraged private industry to assume nearly all of the production tasks connected with the exploitation of new resources.

Description of Chilean fisheries activities

General data

Area	1 600 000 km^2
Seacoast	4 200 km^2
Population	
Delivery of fish per inhabitant	15.8 kg/year
Catch volume (1985)	4 800 000 tons
Estimated employment (1984)	51 000
Nature of the operations (catches) (1984)	90% industrial-scale/10% small-scale

Activities

Owing to the large volumes extracted and the limited internal consumption, the Chilean fisheries industry is highly dependent on international markets. This explains its dynamic nature and its adaptability in applying new technologies.

In view of the potential magnitude of its fisheries resources, the existing level of exploitation and the effect of these activities on the national economy, it is fair to characterize Chile as a fishing country with a sizeable industrial-scale sector and an eminently export-oriented marketing policy.

Provided there are no significant ecological changes to alter the abundance of the marine resource reserves and assuming continued relative stability and normal behaviour on the part of the external markets, the fisheries industry should be able to maintain its sustained growth through structural improvements, even though the resources may be reaching their effective limits.

The activities of the national fisheries sector have experienced extraordinary growth in recent years, and this has resulted in an increase in the extent of its contribution to the national economy. One of the features that has distinguished this growth has been the transformation of the fisheries industry into an important source of foreign exchange, given that 80 per cent of the gross value of Chile's fisheries production has been channelled to external markets.

During 1984 the value of sea product exports reached $US 441.8 million or 12.1 per cent of the nation's total trade abroad. This marked an increase in the contribution of the fisheries sector of 86.9 per cent over the value exported in 1979 and of 8.1 per cent over the 1982 figure (see table 2).

Another noteworthy characteristic of fisheries industry, and in particular of its industrial-scale sector, may be seen in its dynamic expansion during the period 1977-1981, when the growth rates for each of those years were respectively in the order of 31 per cent, 22 per cent, 8 per cent and 14 per cent over the previous year's figure - all of these rates being higher than those of the remaining sectors of the economy.

The total contribution of the fisheries sector to the gross national product during the period 1977-1984 fluctuated between 1.1 and 2 per cent, and it is expected, on the basis of the projections that have been made, that this level of participation in the GNP will be maintained in 1987.

The fisheries sector is of major social importance, considering that in 1984 it provided more than 51,000 jobs in one of the Latin American countries with the highest per capita consumption of fisheries products (between 15 and 17 kg/year).

Resources

The basis of the Chilean fisheries industry consists of the country's pelagic resources, among the most important of which are the Spanish sardine, which in 1984 accounted for 55 per cent of the catches, and the horse mackerel (jurels) with 31 per cent. There are no published statistics on the recoverable reserves of these species, which are very difficult to determine, particularly because the size of the catches taken by vessels flying third-country flags within the 200-mile limit is unknown. Nevertheless, it is estimated that a figure of more than 4 million tons would be close to the maximum level.

With respect to the demersal resources, it is estimated that the potential is in the order of 150,000 tons/year, the principal species being the Chilean hake and the congers (with an estimated potential of 65,000 tons for the former).

The benthic resources provide the basis for a sizeable small-scale fisheries sector engaged in the gathering of "locos" (a gastropod shellfish native to the Pacific), sea-urchins (already overexploited), spider crabs and lobsters.

In other words, the total potential would be in the order of 4.2-4.5 million tons/year.

Other possible resources are tuna, bonito, squid, shark and other species.

In addition, there are seven fish culture centres at which research is being conducted into the possibility of expanding the production of cultured species. Among the varieties in question, "choritos",* oysters, trout and "cholguas"** are already being exploited and the sea-urchin stock is being replenished.

Operational infrastructure

The fishing fleet

All told, the industrial-scale fishing fleet comprises 350 vessels with a cargo capacity of 5,557 m^3. During the period 1973-1982, the cargo capacity of this fleet increased by 124 per cent.

The pelagic or coastal fleet consists of 247 vessels with a total cargo capacity of 49,967 m^3. It is estimated that the average age of these vessels is about 10 years.

The demersal or high-seas fleet consists of 93 vessels with a total cargo capacity of 12,050 m^3, the average age being approximately 12 years.

Despite the age of the fleet, which appears somewhat old, the upturn in fishery activities, particularly in pelagic fishing, has prompted the industrial-scale operators to overhaul thoroughly their vessels and introduce modern equipment. One proof of this can be seen in the use of some 20 aircraft for aerial exploration at a utilization rate of five aircraft-hours/day.

Another kind of fleet is represented by the 11 factory ships that operate below 43° SL and provide 23,534 m^3 of cargo capacity.

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* Translator's note: A kind of large clam, occasionally attaining 17 cm.

** Translator's note: A mussel not unlike the "chorito", but much smaller.

In addition, there are a large number of vessels operated by more than 50,000 small-scale fishermen.

Of the total volume of hydro-biological resources exploited, 90 per cent are taken by the industrial-scale fishing fleet and the remaining 10 per cent by the small-scale fishermen.

The on-shore processing infrastructure

Industrial-scale plants in 1984

Type	Number of plants	Installed capacity (tons processed/8 hours)
Freezing *	75	1 135
Canning	42	1 307
Smoking and drying		
Salting	3 **	
Reducing	39	12 971
Total	159	

* Includes 10 factory ships.

** Small-scale production.

The technology employed in the actual fishing activity and in processing is generally modern, with relatively new or renovated equipment as in the case of the pelagic fishing vessels.

Major investments have recently been made in the fish-meal and canning industry, which is operating efficiently. The freezing industry is well equipped, in keeping with the high value of the exported products, which is in turn based on the large variety and good quality of the resources.

The production of dried and salted items, such as cod, using high-value white species, is on a small scale and very limited, with the products internally marketed to coincide with the religious feast days. The products are of good quality, especially the conger eel, but expensive.

The fish-meal industry is one of the largest and most modern in the world and achieves yields of 29 per cent of good-quality meal and oil.

A number of more sophisticated products have been developed, such as the prepared and prefried seafoods, pulps and protein-rich concentrates, but these are still expensive.

A substantial portion of the processing machinery is imported, but much of the equipment used by the fisheries industry is also domestically manufactured.

In competition with the imported items, the country is manufacturing equipment for canneries and reduction plants, autoclaves, exchangers, presses, concentrators, dryers, automatic boilers and, in fact, the entire range of boiler-related equipment. On the other hand, such items as automatic control systems, centrifuges, automatic filletting and packaging lines, refrigeration machinery and motors, and the more sophisticated electronic devices and equipment must be imported.

The fishing fleet is supported by three shipyards, at which, in fact, most of it was built. The fleet itself is currently represented by 340 vessels with an average cargo capacity of 200 tons in the case of the cargo ships and 130 tons for the trawlers.

At present, cargo ships of as much as 500 tons' capacity and trawlers of up to 200 tons' capacity are being built.

The national fisheries industry may be said to have thus far encountered no problems with respect to the supply of equipment and machinery for its normal operation on the basis of the current production technologies.

Marketing

Owing to the relative proximity of the population to the coast and to the unloading sites, fresh products dominate the internal market despite the fact that the poorly structured marketing channels often limit the supply. The current consumption pattern consists of approximately 70 per cent fresh fish, 25 per cent canned fish and about 3 per cent frozen fish.

External marketing is in the hands of commercial enterprises and has also been officially promoted. Fish-meal marketing activities are under the control of a producers' corporation that by itself accounts for 90 per cent of the exports. This arrangement has brought a profitable return for the affiliated producers.

Official structure

The regulation of the Chilean fisheries sector is the responsibility of the Ministry of Economic Affairs, Promotion and Reconstruction and of the National Fisheries Service acting as the implementing agency.

Official technical training is provided at 29 centres, 23 of which have a university affiliation. A number of universities confer specific academic degrees in the fisheries area.

Principal problems and limitations

- The apparent attainment of maximum levels in the exploitation of the most important resource species;
- Overfishing of benthic resources;
- Internal distribution;
- Lack of official standards and control procedures for export products;
- Unprofitableness of the small-scale fisheries sector;
- A system that is sensitive to fluctuations in the international market and to the country's exchange policies.

Table 1

Unloadings of fish and molluscs
(tons)

Year	Fish	Molluscs	Total	
1973	581 417	82 593	664 010	
1974	1 046 076	81 696	1 127 772	
1975	804 222	95 236	899 458	
1976	1 237 053	144 546	1 378 599	
1977	1 204 958	113 991	1 318 949	
1978	1 812 948	116 140	1 929 088	
1979	2 428 196	131 278	2 559 474	
1980	2 699 853	116 853	2 891 299	(1)
1981	3 290 670	102 786	3 503 087	(2)
1982	3 576 955	96 278	3 846 608	(3)
1983	3 852 300	118 600	4 161 200	(4)
1984	4 363 070	136 192	4 674 018	(5)

Source: National Fisheries Service Statistical Handbook for 1982 and updated figures.

(1) Includes 74,523 tons of algae.
(2) Includes 109,631 tons of algae.
(3) Includes 173,375 tons of algae.
(4) Includes 190,300 tons of algae.
(5) Includes 174,756 tons of algae.

Table 2

Participation of the fisheries sector

		Exports	
Year	%	Total nation (millions $US)	Fisheries (sector) (thousands $US)
1976	5.1	2 116	107 210
1977	6.6	2 185	144 033
1978	7.5	2 460	183 361
1979	6.2	3 835	236 334
1980	8.0	4 705	378 800
1981	10.4	3 906	404 859
1982	10.7	3 821	408 780
1983	11.5	3 826	439 157
1984	12.1	3 650	441 882

Source: Central Bank SSP.

Table 3

Gross National Product
(millions of 1977 $US)

Year	Total	Fish. sect.	Share %
1976	261 945	1 259	0.48
1977	287 770	1 453	0.50
1978	183 361	1 712	0.55
1979	337 207	1 956	0.58
1980	363 446	2 104	0.58
1981	384 232	2 485	0.64
1982	329 155	2 704	0.82
1983	327 180	2 959	0.90
1984	347 926	3 299	0.95
*1985	361 673	3 421	0.95
*1986	379 620	3 250	0.86
*1987	398 470	3 426	0.86

Source: Central Bank 1976/1984
Projections for 1985/1987 from SSP.

* Estimated projected values.

Table 4

Export products in 1982 and 1984, according to process type

Category	1982		1984	
	Tons	Thousands of $US	Tons	Thousands of $US
Frozen	57 906	86 318	46 415	75 677
Canned	12 091	17 171	28 021	38 164
Smoked	2	18	-	-
Meal	770 563	254 554	781 026	275 835
Oil	89 232	26 879	34 748	28 549
Algae	25 715	18 794	26 335	14 346
Fresh	41	115	-	-
Eggs	832	1 010	-	-
Others	-	-	-	-
TOTAL	956 382	404 859	981 839	441 882

Source: National Fisheries Service (SERNAP). Rev. 73-82 and current data.

Table 5

Exports for 1984, according to product type

Product type	Tons	Thousands of $US
Fish meal	781 026	275 835
Frozen fish	34 170	35 581
Canned fish	24 187	19 776
Frozen crustaceans	6 016	18 732
Canned crustaceans	736	5 714
Frozen molluscs	6 229	20 364
Canned molluscs	3 098	12 674
Algae	26 335	14 346
Agar-agar, collagar	601	7 138
Fish oil	94 748	28 549
Others	2 331	2 173
TOTAL	981 839	441 882

Source: Office of Agricultural Planning (ODEPA).

Table 6

Fishery catches, production and exports:
recorded for 1980-1984 and projected for 1985-1986

Year	Volumes unloaded (tons)	Production (tons)	Exports (millions of $US)
1980	2 891 299	-	378.8
1981	3 503 087	860 502	404.8
1982	3 846 608	1 025 095	408.7
1983	4 161 200	978 316	439.1
1984	4 674 018	1 348 000	441.8
1985*	3 442 000	882 440	455.0
1986*	3 496 700	901 510	500.0

Source: SSP.

Note: The apparently low figure for the 1984 exports in comparison with that year's catches and production is due to a marked decline in the prices for fish meal and oil.

* Projected values.

Colombia

Introduction

Colombia is the only country in the region with a long seacoast on both the Pacific and the Atlantic oceans. Moreover, located within it is the vitally important basin of the River Magdalena, which is the centre of a highly developed small-scale fisheries sector, in contrast to the country's relatively lagging exploitation of its marine resources.

It is noteworthy that, despite this diversity of fishery resources, during the period 1979-1983 the country imported twice as much (in dollar terms) as it exported, even taking into account its exports of such valuable cash products as shrimp.

The real importance, however, of the Colombian fisheries sector is not to be found in such unadorned economic indicators as its share of less than 0.5 per cent in the gross domestic product, or the minor participation, at 5-6 per cent, of the agricultural sector in national exports, but rather in its important socio-economic role. The latter becomes obvious when one considers that the small-scale fisheries sector provides direct employment for 150,000 persons and, when all the related operations are considered, for as many as 900,000 persons, including their families. For its part, the industrial-scale sector contributes some 4,000 jobs.

General data

Area of the country	1,138,300 km^2
Continental platform	48,365 km^2
Total length of the seacoast	2,960 km^2
Exclusive economic zone	980,000 km^2
Population (1978)	25,618,000 km^2
Consumption per inhabitant	4-4.5 kg/year
Catch volume (1984)	76,000 tons

Following a period of stagnation and recession during the 1970s, the sector now appears to be recovering, having greatly reduced the negative fisheries trade balance of 1984.

There are a large number of public agencies in Colombia that are concerned in one manner or another with fishery activities, a fact that complicates their practical work. In any event, the fisheries industry is ultimately dependent, in a formal sense, on the Ministry of Agriculture.

Description of fishery activities in Colombia

Because of its geographical situation, the country is in a position to exploit a variety of resources. In the area of marine fishing, there are in principle two primary possibilities, the first being tuna and the other shrimp and lobster, in addition to a number of small pelagic species.

With its two-ocean coastline, the country has low-cost access to important export markets. In addition, the prevailing seaboard climate and the relief of the coastal regions afford the interesting possibility of cultivating aquatic products. The Government is currently engaged in promoting private investment in the cultivation of shrimp, to which end laboratories for the raising of the young breeds are being built.

There are, in addition, very extensive inland-water activities, facilitated by the natural conditions (with the sole drawback of the pronounced seasonal differences), on the various rivers, of which the Magdalena, with its potential

resources of 120,000 tons/year, is the largest. The supply of fish products to the population depends essentially on the production of the inland fisheries.

Resource utilization

During the period 1980-1984, the average annual catch volume was 75,000 tons, of which 64 per cent was the result of inland operations, with the rest accounted for by the marine fisheries. The decline in marine fishery activities is connected with the lower level of exploitation of the pelagic species for fish meal and canning.

Of the 76,885 tons produced in 1984, 20 per cent was delivered by the industrial-scale marine fisheries, 13 per cent by the small-scale marine fisheries, 65 per cent by the small-scale inland fisheries and 1.2 per cent by the mariculture sector.

The Magdalena basin is the site of 85 per cent of Colombia's inland fishery operations, being followed in order of importance by the Amazon with 8 per cent, after which come the Orinoco, the Simő and other rivers.

The mariculture sector is based on shrimp, representing a new activity, while trout, "cachama"* and tilapia are the principal aquaculture products.

The inland fisheries are engaged in supplying the internal market with fresh fish and in exporting ornamental varieties.

The marine fisheries supply the industry exporting shrimp (frozen), meal and canned products.

During the period 1970-1982, the State's credit policy encouraged investments designed to promote exports.

The industrial-scale shrimper fleet consists of 200 boats, representing 75 per cent of the total number of fishing vessels. A few of these craft shrimp in deep water and the rest in shallow water. Fifteen per cent of these vessels are engaged in catching whitefish, while six boats fish for tuna and 15 catch lobsters.

Approximately 40 per cent of the fleet operates under a foreign flag.

The processing industry relies on 19 cold-storage facilities, 13 of them on the Pacific coast and six on the Atlantic, with a total freezing capacity of 750 tons/day, a storage capacity of 3,700 tons and an ice-making capacity of 196 tons/day. Some 3,800 persons are employed at these facilities.

There is very limited small-scale marine fishing, and what little there is is engaged in exploiting such whitefish resources as bass, sea bream, dusty sea perch, croakers and others. The catches represent only a small portion of the available stocks. The fishermen encounter serious difficulties in marketing their hauls, since adequate facilities for preservation and transport do not exist. The National Association of Small-Scale Fishermen (ANPAC) is promoting the formation of fishermen's co-operatives.

Similar problems of preservation and transport confront the small-scale inland fishermen. In this case, another serious problem has to do with the six months' or longer period of inactivity for these fishermen, who rely very heavily on what they

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* Translator's note: A native fish similar to the mullet.

produce, since their self-consumption is extremely high and they have no alternative sources of employment.

The technology used

Given the high value of the shrimp, adequate techniques are used for shipboard treatment. The unloading facilities are few in number and, as far as their cold-storage capacity is concerned, they are devoted almost exclusively to this resource. In general, these installations have used imported technology for the reason that there is no local manufacture.

The canning and fish-meal production facilities employ conventional methods and operate well below capacity for reasons of unprofitability and inadequate raw material supplies. The canning sector in particular is not developing in a competitive way with the Ecuadorian canning industry, whose lower-priced products are flooding the market.

With respect to the inland fisheries, the conditions of handling, preservation and transport are very poor and there is inadequate production of ice. The aforementioned National Association of Small-Scale Fishermen is endeavouring to improve the situation through the work of the Small-Scale Fisheries Service Centres (CESPA).

Marketing

Consumption in the internal market is low and, in addition, poorly distributed, normally reaching only one-fifth of the population. Demand is expected to increase as purchasing power rises.

Over the last decade Colombia has become a net importer of fish. This is due to the levelling out of the country's exports and the higher level of its imports. The economic environment of the Andean Pact favours the entry of fish meal and canned fish from Ecuador and of refrigerated and frozen fish from Peru. This development has had a substantial negative effect on the national industry.

The most important exports are based on shrimp and ornamental fish.

Principal problems and limitations

A. For small-scale fisheries

- Lack of preservation, handling, marketing and transport facilities;
- No possibility of access to credit owing to the absence of guarantees;
- Non-existence of alternative or complementary activities for the Magdalena fishermen during the period when the fish are returning to spawn;
- Poor socio-economic conditions on the part of the fishermen;
- Inaccessibility of certain zones.

B. For industrial-scale fisheries

- In the case of the shrimp sector, lack of domestic technology and equipment and also of trained personnel;
- In the case of the canning and fish-meal sector, lack of competitiveness within the Andean Pact.

National fisheries production for 1984
(in tons)

Large-scale marine fisheries	15 181.0
Small-scale marine fisheries	10 024.0
Small-scale inland fisheries	50 146.0
Inland aquaculture production	620.0
Marine aquaculture production a/	914.0
Total	76 885.0

a/ The data for 1984 were supplied by the Office of Statistics, Institute for the Development of Natural Resources INDERENA. Aquaculture production (1,534 tons) is not included.

National fisheries production for the period 1975-1984
(in tons)

Year	Marine Fisheries	Continental Waters	Total a/
1975	24 500	42 210.1	66 710.1
1976	23 600	51 601.3	75 271.3
1977	21 791	42 390.9	64 181.9
1978	22 966	56 957.7	79 923.7
1979	14 858	48 805.5	63 663.5
1980	29 254	47 120.1	76 364.1
1981	46 971	48 004.0	94 975.6
1982	22 386	49 000.0	71 386.0
1983	12 212	45 343.0	57 556.0
1984	25 205	50 146.0	75 351.0

Source: Office of Statistics, INDERENA - FAO.

a/ The figures refer to monitored fisheries activities. Unmonitored activities are estimated by INDERENA at 30 per cent, including crustaceans and molluscs.

Ecuador

Introduction

The Ecuadorian fisheries industry is the country's second-most important economic sector after petroleum and is therefore an area of priority concern on the part of the Government. At present, it contributes nearly 3 per cent of the gross domestic product. The regulatory agency responsible for this industry is the Department of Fisheries Resources (Subsecretaría de Recursos Pesqueros), which is subordinate to the Ministry of Industries, Commerce, Integration and Fisheries.

General data

Area	283 600 km^2
Continental platform	25 450 km^2
Length of the coastline	850 km
Population (1977)	7 555 000 inhabitants
Delivery of fish per inhabitant	10.4 kg/year
Catch volume (1985)	1 200 000 tons
Contribution to the GDP	2.9 per cent
Exports (1985)	$US 255 962 000

The Ecuadorian fisheries industry has experienced dramatic growth in recent years. In 1975 the fisheries sector contributed only 0.8 per cent to the GDP, which is to say that this indicator more than trebled within a period of 10 years.

The resources consist of tuna, small pelagic varieties, such as shad, Pacific mackerel and anchovies, crusteaceans, especially shrimp and lobsters, squid and various fish.

The fish culture sector has also grown at a very rapid pace, especially through the cultivation of the species Penaeus, Vanmamei and P. stylirostis in the appropriate coastal zones.

There are three forms of culture: extensive, semi-extensive and semi-intensive, with yields of 600, 1,500 to 2,400 and 3,000 to 5,000 pounds per hectare/per annum, respectively. The great development of this sector has led to the need to produce larvae on a large scale. This is currently being done at ten laboratories located mainly in the Province of Guayas. An additional 35 laboratories are in the process of construction at various points along the coast.

Fishing fleet

In 1985 the composition of the fleet was as follows:

264	shrimp boats	- 5 989	net registered tons
170	sardine boats	- 7 660	" " "
70	tuna boats	- 4 963	" " "
1	lobster boat	- 29	" " "

In addition to this industrial fleet, 15 vessels (mainly Japanese and Korean), associated with Ecuadorian enterprises, were also in operation.

Processing

Canning. The varieties used for canning include the tuna, the alewife, the mackerel, the scallop and the shrimp. The industry has an annual capacity of 8,589,445 48-can cases/year, calculated on the basis of an eight-hour working day. The products produced are of poor quality and low price.

Freezing. The principal varieties frozen are shrimp, tuna, alewife, mackerel, whitefish, lobster, scallops, snails and squid. The freezing capacity is about 400,000 tons, assuming an eight-hour day and 240 working days a year. On the average, 15-20 per cent of this capacity is actually used.

Meal and oil. The meal and oil plants mainly use the small pelagic varieties, which are caught in large volumes. Production in this sector rose sharply in 1985

In addition, salted and dry-salted products and by-products of shark, turtle and other species are produced.

Marketing

In 1985 the following quantities of the principal products were exported:

	$US	Tons
Total	261 653	308 080
Frozen tuna	7 090	8 538
Other frozen products	11 395	21 513
Salted items	123	53
Salted shark fins	460	46
Frozen shrimp	161 089	20 270
Canned products	20 975	14 690
Meal	58 050	232 924
Oil	2 436	10 039

In the internal market, fish is mainly consumed fresh. The following figures were recorded in 1984:

Total	53 566 tons
Canned	14 487 tons
Fresh and frozen	1 439 tons
Meal	17 494 tons
Oil	20 tons
Others	

Principal problems

- Inadequate handling infrastructure;
- Difficulties in controlling the rapid growth of the industrial-scale sector;
- Lack of information regarding resources;
- Inadequate gathering of data;
- Poor quality of the meal, oil and canned products;
- Inadequate inspection systems;
- Inadequate support facilities for the fleet in general.

Dominican Republic

Introduction

The country has an area of 48,734 km^2, a coastline of 1,575 km, a continental platform of 8,950 km and an exclusive economic zone of 238,250 km^2, in which, however, it does not exercise an effective national presence.

Despite the Dominican Republic's insular character and the fact that 15 of its 27 provinces are bordered by the sea, and notwithstanding its 108 river basins (to which the reservoirs created by various water-management projects are gradually being added), the national fisheries sector is underdeveloped. It must be stressed that this is not so much a matter of the capture figures in comparison with the available resources as it is of the generally inadequate methods of handling and utilization.

Owing to the lack of information regarding the application of appropriate technologies, and also because of certain dietary prejudices and attitudes, fishery

of all the parties involved, from the fishermen to the export agents. Specifically, the exports of high-value shellfish have recently been plagued by serious problems in external markets because of the inadequate handling and processing associated with these products.

The principal obstacles to the growth of the fisheries sector lie in the general ignorance of adequate handling techniques, the poor productivity of the surrounding waters, situated as they are over a narrow platform, and the deeply rooted preference of the local population for imported "herring" and "codfish", which have been traditionally consumed and for which, because of their popularity, substitutes based on local species cannot be found.

The available official statistics speak of the possibility of a maximum fisheries yield in the order of 26,000 tons/year, which would imply an increase of 80 per cent in the catch volume over the 1984 figure, although, given the heterogeneity of the resources, this will be very difficult to achieve. On the other hand, there is the additional possibility that tuna might be caught in more remote zones, along with other pelagic varieties.

In summary, the country has no fisheries industry apart from the initiative undertaken by the Price Stabilization Institute (INESPRE) with a view to the production of herring- and cod-type products based, in principle, on imported raw material and aimed at providing a substitute for the imported final products, and leaving aside also a number of efforts by private operators and mixed enterprises in the area of the semi-processing of tuna. With respect to fish processing, there are a number of projects that involve the cultivation and processing of shrimp for export and that, having been backed by sizeable investments, are currently in the implementation phase.

If one had to offer a succint description of the country's situation with respect to the status and potential of its fishery activities, it would be fair to say that the Dominican Republic does not exhibit the kind of characteristics likely to transform it into a "fisheries country", but that the fisheries sector could still perform a very important role in the local diet and make an essential contribution to the improvement of the trade balance through import substitution, while at the same time acting as the generating source of a large number of employment opportunities with all the related far-reaching social effects. The existence of resources of very great value should make it possible to employ advanced technologies so as to achieve the maximum value added for the most sophisticated and most favourably priced products in the international market. In addition, the shrimp farming currently being developed opens up promising prospects along the same lines.

Economic and social importance of fishery activities in the Dominican Republic

Although the possibilities for the development of the fisheries sector in the Dominican Republic are limited, in qualitative terms this sector has an important function to perform in supplying fish for domestic consumption, since, on the basis of an equivalent live-weight estimate, the imports duplicate local production. The relevant figures for 1984 may be expressed as follows:

Production	14 600 tons	(live weight)
Imports	32 000 tons*	(live weight)
Exports	500 tons*	(live weight)
Total supply	46 100 tons	(live weight)
Kg per inhabitant	8.14	(for 5,647,977 inhabitants in 1980)

* Estimated live weight values, considering the type of product in

It will be seen that, when expressed in this way, the amount of fish available per inhabitant takes on a significant value.

In addition, the primary fisheries sector provides employment for nearly 7,000 persons, to whom some further 2,000 persons, engaged in subsequent stages, may be added, making a total of 9,000.

The contribution of the fisheries industry to the gross domestic product has grown conspicuously in recent years, bearing in mind that in 1984 its share was put at only 0.68 per cent.

If, for the same year, we inquire into the fisheries sector's contribution to the gross agricultural product, we arrive at the significant figure of 3.98 per cent. In addition, this same sector provides about 1 per cent of total agricultural employment.

With respect to exports, fishery sales abroad represent 0.23 per cent of the national total.

Description of the Dominican fisheries system

- A highly underdeveloped national fisheries sector co-existing with deeply rooted fish consumption habits favouring dry-salted products (codfish) and smoked products (herring), which have traditionally been imported.

- Low-yielding marine fishing grounds (typical tropical system with many species and low concentrations).

- The 1980 population of some 5.5 million inhabitants consumed 6.2 kg per inhabitant per annum (some 8.2 kg if the equivalent live weight of the imported products is estimated).

- The activities are primarily of a small-scale marine and coastal nature and employ small-scale techniques involving very poor handling and very little processing (with the sole exception of the shellfish - lobster, "lambis" and others - which are exported).

- The primary sector employs about 7,000 persons, to whom a further 2,000, engaged in subsequent stages, may be added.

- Aquaculture and inland fisheries are at the very first stages of development, although there is great interest on the part of private investors in the raising of shrimp for export to the United States.

- There is an interest on the part of the Government in using imported raw materials to provide low-cost domestically produced substitutes for the imported codfish and herring.

- The country enjoys a strategic geographical location and a commercially favourable position for the export of shellfish to the United States.

Principal limitations

- Low-yielding marine fisheries and the non-existence of species suitable for use in the preparation of the products in greatest demand.

- Ignorance of fishery technologies and business management methods.

- Lack of facilities for unloading, handling, processing and marketing.

- Lack of trained personnel in all subsectors and at all levels.

Table 1

National production of fish and shellfish (catches)

Year	Catch tonnage of freshwater fish	Catch tonnage of sea fish	Percentage of marine catches	Total fish	Total shellfish	Percentage of fish	General total
1973	359	7 977	95.7	8 336	726	92.0	9 062
1974	325	7 568	95.9	7 893	443	94.7	8 336
1975	544	5 793	91.4	6 337	624	91.0	6 961
1976	684	5 799	89.4	6 483	465	93.3	6 951
1977	252	3 760	93.7	4 012	480	89.3	4 492
1978	697	4 675	87.0	5 372	735	88.0	6 107
1979	1 674	6 197	78.7	7 871	1 413	84.8	9 284
1980	3 748	6 781	64.4	10 529	2 173	82.9	12 702
1981	4 659	7 245	60.9	11 904	2 620	82.0	14 524
1982	N.D.	N.D.	N.D.	9 902	2 581	79.3	12 483
1983	3 628	8 360	69.7	11 988	3 300	78.4	15 288
1984	1 758	10 409	85.6	12 167	2 446	83.3	14 613

Source: Ministry of Agriculture.

Table 2

National catches of the most important shellfish

Year	Shrimp	1 Sea 2 River	Lambis	Clam	Lobster	Others	Total
1979	172 784) 161 070)	333 854	374 646	60 845	308 796	N.D.	1 412 522
1980	226 481) 520 214)	746 695	641 870	42 529	151 094	N.D.	2 172 930
1981	147 238) 408 066)	555 304	1 179 045	55 831	203 298	N.D.	2 619 524
1982	425 801) 188 465)	614 266	1 082 348	90 570	245 152	N.D.	2 581 121
1983	345 256) 344 229)	689 485	1 240 233	160 872	545 441	N.D.	3 300 341
1984	119 057) 179 750)	298 807	1 503 696	176 721	165 145	N.D.	2 446 075

Source: National Office of Statistics/Ministry of Agriculture.

Latin America and the Caribbean

General conclusions regarding the region

The legal framework

A rapid review of the situation with regard to the legal instruments with a bearing on fishery activities in the region requires that two fundamental aspects be considered: on the one hand, the attitude and concrete position taken regarding the new method of establishing the 200-mile-wide offshore area as an exclusive economic zone and, on the other, the internal legislation governing the regulation of fisheries in each country, as well as the sector's institutional structure.

The attitude of the countries of the region towards the establishment of the 200-mile EEZ

Regardless of formal differences in terminology and in the implementation of the system, the region as a whole and, particularly, Chile, Ecuador and Peru have pioneered the adoption of the concept of the 200-mile offshore area as an exclusive economic zone by extending their sovereignty into this area on the basis of the Santiago Declaration of 18 August 1952. Ever since the approval of that document, this question had been the central subject of the conferences held on the law of the sea until, at the third such conference, a final regulation was arrived at under the formula providing that, with respect to its exclusive economic zone, the riparian State possesses "rights of sovereignty for the purposes of the exploration, exploitation, conservation and administration of the natural resources".

The norms regulating fishery activities in each country, and the institutional structures of the sector

As far as the Latin American and Caribbean region is concerned, this is possibly the area in which the most serious mistakes have been committed or there has been the greatest inattentiveness, and where, therefore, there is much to be done on an immediate basis, but with a view to the future.

In those countries in which the State is most involved in the fisheries sector the problem is one of excessive regulatory control, coupled with the failure to establish clear guidelines for the assistance of private operations best suited to the national interest. Typifying this situation is Argentina, where there is the additional problem of the overlapping of functions among various government agencies. The most common situation throughout the region, however, is the lack of an institutional structure or of the legal instruments necessary for properly monitoring the development of the fisheries, identifying the needs of the sector, and assisting and supporting it so that it may achieve the greatest possible growth consistent with the means and resources available.

The level of resource utilization

On the question of resource utilization too, very dissimilar and indeed nearly diametrically opposite situations can be observed. Whereas in the case of Chile the maximum level of exploitation for the most important pelagic resources appears to have been reached, Peru years ago experienced the collapse of the world's largest fisheries industry, and in the south of Brazil nearly all the species of the ecological system of the Los Patos Lagoon have been overfished. In other areas, such as along the Colombian coast, there is virtually no fishing, despite the presence of locally available and exploitable marine resources.

By way of a general evaluation one might say that the region possesses substantial wealth in underexploited or unexploited resources, but not to the degree often alleged by countries that operate large fleets and require access to fishing grounds under the sovereignty of third parties.

The increasing percentage of production intended for direct human consumption must be singled out as a positive development.

Lately, the greatest fishing effort has been directed towards sardines, herring and anchovies, which account for more than 40 per cent of the total, and towards the horse mackerels, mullet and sauries, which make up approximately 10 per cent.

On the other hand, the shrimp, tuna, lobster, hake and other catches are smaller in volume but of great value in the international market, representing as they do important sources of foreign exchange.

A development meriting particular mention is the official encouragement that has been given in a number of countries to aquaculture and, above all, to brackish-water aquaculture, which could soon become a self-sustaining activity, as has already happened in the case of the large-scale development of shrimp culture in Ecuador. Chile, Mexico, Peru and Colombia stand out as important mariculture producers and for their efforts in the raising of shrimp, mussels and oysters. Another new development is the production in large quantities of scallops in Peru as the result of the climatic changes introduced by the El Niño phenomenom. In Argentina the dramatic surge in the export of prawns and the sharp current reduction in the reserves of that resource have prompted industrial-scale operators to study the alternative of mariculture as a way of compensating for the shortage in natural suppies. Even in countries in which until now there has been no fisheries industry, substantial amounts of money are being invested today in the cultivation of prawns and shrimps in brackish waters with a view to the external marketing of high-value products.

The handling and processing infrastructure and its capacity

The failure, thus far, by the Governments of the region to pay much attention to their fisheries sectors is evident in the absence of adequate port infrastructure and marketing facilities at the initial sales level. In addition, even in those cases in which sizeable investments have been made in these facilities, the work has not been carried out in co-ordination with the operators who are to use them. The result is that the users have, in large measure, failed to profit from the advantages offered, specific examples being the large fishing terminals erected in Peru and the unloading sites for small-scale fishermen built in the Brazilian Amazonia.

With regard to the privately operated handling and processing infrastructure, important advances have recently been achieved, so that, currently, most of the countries of the region with significant industrially exploitable fishery resources have available a processing capacity that is commensurate with the volume of the resources available and, in some cases, even too large. The countries that have thus far not promoted the growth of their fisheries industries, because of the economic difficulties facing them and the burden represented by a negative fisheries trade balance, are now engaged in an effort to develop import substitutes to the degree possible, if only on the basis of imported raw materials.

In summary, considering the region as a whole, one finds that its fishery activities continue to be mainly concentrated in the area of reduction, thanks to the heavy external demand and the possibility of producing fish meal at a profit. In addition, production intended for direct human consumption has recorded a rate of growth disproportionate to the dietary requirements of the region. This development is in large measure a consequence of the fact that the fundamental structure of fishery activities has been essentially an export-oriented one, another reason being that the industrially produced fishery items are very often nearly beyond the reach of populations, large segments of which have only limited purchasing power.

The technology

In recent years there has been evidence of some interest on the part of the Latin American Governments in developing technologies for the purpose of finding alternatives in their fisheries production for human consumption through the more efficient use of the more abundantly available species so as to offer the public low-cost products with wide consumer appeal. Major advances in this area have been achieved in particular by Cuba, Mexico and Peru, but also by Ecuador, El Salvador, Nicaragua and Venezuela.

Those countries that, with a view to introducing their products to external markets, have developed their fish-reduction industries (Peru and Chile), their refrigeration industries (Argentina and Uruguay) and their canning industry (Ecuador, Peru and Chile) have had to introduce the kind of technologies that would enable them to compete internationally. As a consequence, they have been faced with the need to optimize the various stages of their production cycles. Particularly noteworthy examples of this trend may be seen in the high yields achieved by the vessels fishing for pelagic species in Chilean waters and also in the efficiency with which these resources are processed for the production of fish meal.

In the area of frozen whitefish production, Argentina and Uruguay have attained yield levels remarkable for their use of labour and of machinery and equipment available in the domestic market. In Argentina in particular, local industry has reached the point where it currently manufactures practically all the machinery and equipment needed, with the exception of the filletting machines and a number of high-technology refrigeration equipment items. The fact is that Argentina has developed an entire industry that, in addition to supplying that country's own fisheries sector, has succeeded in exporting turnkey refrigeration plants. Brazil also, in this particular area as well as in the canneries sector, has achieved a high degree of technological self-sufficiency.

Given the extent of the takeoff achieved in the application of "appropriate technologies" geared to the fishery activities of the region, the possibility exists that the solution required by countries less well endowed in this regard may be found within the region itself.

Nature of marketing

Considering the exports of the region's fishery products as a whole, it will be observed that during the period 1980-1984 the trend for these exports was on the whole upward, while imports tended to decline. For example, in 1980 imports reached an equivalent volume of 24 per cent of exports, whereas in 1984 they represented only 16 per cent of the exported volume, with the trade balance for fishery products recording, for the five years in question, an average surplus of $US 1.7 million.

Despite the fact that the export fisheries industry in Latin America is structured around a narrow range of products, recent years have witnessed something of a trend towards diversification. Leading the other countries in terms of exported volumes is Chile with about 50 per cent of the region's total exports, followed in second place by Peru and, thereafter, by Argentina, Uruguay, Ecuador, Mexico and Cuba. If we consider the region's total production and its exports, we shall be struck by the high degree to which the fisheries industry is oriented towards the external market, for which in fact it earmarks more than 60 per cent of its output.

On the other hand, an analysis of the full range of products exported and imported by the region will reveal that there are major possibilities for increasing regional self-sufficiency in supply.

With regard to internal consumption, a number of countries have endeavoured to increase this consumption through consumer education programmes and various promotional campaigns. The success of these initiatives has been very modest, pointing up the fact that the consumption of fish is not a deeply-rooted habit among the peoples of Latin America. On the other hand, it seems clear that the prospec s for growth are contingent on the production of items of reliable quality and low cost. The existing consumption pattern consists mainly of fresh and refrigerated products so that, because of the inadequate cold-chain facilities and marketing channels, most of these products are consumed in localities close to the unloading sites.

Obstacles to the development of the industrial-scale fisheries sector

In the light of the foregoing remarks regarding the limited nature of internal consumption, it is natural that industrial-scale projects should be linked to expectations focused on the external market. This implies a necessary response capability coupled with quality, quantity and price levels compatible with participation in that market. A capacity of this kind will require the availability of raw material on a reliably regular basis and on economical terms, together with the use of adequate technologies, equipment, machinery, facilities and trained personnel, not to mention the possibility of access to financing in the necessary amounts and at reasonable costs.

In the best of cases there are only a few countries in which business operators can count on all these factors, and even there the exception will be favourable financial conditions, the lack of which is in fact one of the principal barriers to development.

This lack of financing is no accident, but is inherent in the general financial and economic difficulties facing these countries and in the traditional inattentiveness to the fisheries sector on the part of their Governments, which have by and large not been able to implement comprehensive development policies on behalf of the fisheries industry. In many cases, the reason for this failure lies in the fact that the States in question lack the specific institutional structures capable of envisaging the possibilities and introducing the necessary measures.